# Seep 2 CKD Area Augmentation Pilot System Design Report Targeted Leachate Collection

Little Traverse Bay CKD Release Site Emmett County, Michigan

Prepared for CMS Land Company and CMS Capital, LLC

April 29, 2008



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#### **Little Traverse Bay CKD Release Site**

# Seep 2 CKD Area Augmentation Pilot System Design Report - Targeted Leachate Collection

#### April 29, 2008

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This Pilot System Design Report (Report) has been prepared Barr Engineering Co. (Barr) on behalf of CMS Land Company and CMS Capital, LLC (referred to collectively as CMS) as a result of a U.S. EPA order to augment the existing interim leachate recovery system at the Seep 2 CKD Area at the Little Traverse Bay CKD Release Site. This Report is a continuance of the removal action activities as described in a conceptual augmentation plan submitted to U.S. EPA on February 4, 2008 describing the augmentation of the Seep 2 CKD Area via targeted leachate collection. On March 26, 2008 the U.S. EPA approved the conceptual approach as submitted on February 4, 2008. A modification to this approval on April 8, 2008 indicated that the Phase 1 Pilot System Design for targeted leachate collection at the Seep 2 CKD Area is to be completed by May 1, 2008.

This Report describes the pilot system design, existing site conditions affecting design, construction considerations, and operation and maintenance considerations. This Report relies on the Removal Action/Remedial Investigation (RI) Report submitted to the U.S. EPA on March 1, 2008 for the development portion of the Site. In conjunction with the pilot study a design investigation will be conducted to provide the necessary information for final design for targeted leachate collection at the Seep 2 CKD Area. The final design which will incorporate the design investigation and pilot study results will be completed by August 31, 2008. A Michigan Department of Environmental Quality (MDEQ) joint permit application will be submitted to the MDEQ as a form of notification and assurance that the augmentation to removal actions at the Seep 2 CKD Area conforms to state and federal rules and regulations governing wetlands.

This Report provides the design basis for the Seep 2 CKD Area targeted leachate collection pilot study. The goal of this removal action activity is to prevent the discharge of high pH leachate to Lake Michigan. This pilot study will include the installation of a targeted leachate collection well in an area known to have high pH leachate. Planned objectives for the design investigation include installation of rotasonic bedrock boreholes

in the vicinity of borehole B2025 in order to define the shale geometry in this area and obtain pH profiling data in the boreholes. Installation of targeted leachate collection wells will be considered in boreholes with high pH values, to facilitate the collection of leachate at the point of generation. A plan for the design investigation is included in Appendix A.

This Report provides the design basis for the Seep 2 CKD Area targeted leachate collection pilot study. In order to design the pilot study it was necessary to evaluate the existing conditions at Seep 2 CKD Area and evaluate the design, construction, and operation and maintenance considerations. Design objectives for the pilot study include pump selection, recovery well design, discharge line design and route and power requirements. Detailed design drawings for the pilot study are included in Appendix B.

#### 2.1 Existing Conditions

The pilot study design is based on the review of existing site conditions and data. Existing site data includes boring logs, soil and bedrock characteristics, topography, geologic investigations, and groundwater monitoring data. The location for pilot study implementation was selected based on the existing information near borehole B2025 (see Figure 1).

#### 2.1.1 Water Elevations and pH Levels

Evaluation of water elevations in conjunction with pH levels concluded that a targeted leachate collection well near borehole B2025 was the optimal location for the pilot study for targeted leachate collection. A summary of water levels for W2125/W2225/W2325/2425 from April 2006 through April 2008 is included on Table 1. The groundwater elevation varies in W2125 over a range of approximately 1.5 feet. As indicated in the RI Report perched water has been observed in wells installed above the marker shale. The primary mechanism for leachate production in the Seep 2 CKD Area is perched groundwater interacting with the CKD pile. The pH readings in W2125 are shown below.

Location	Date	pH Reading
W-2125	08/01/2006	12.77
W-2125	10/18/2006	12.57
W-2125	01/17/2007	12.79
W-2125	11/28/2007	12.60

#### 2.1.2 Drilling Observations

Boring logs and monitoring well logs are included in Appendix C for those locations within the area chosen for pilot study implementation as shown on Figure 1. The cross section showing the geologic conditions for the area between Coastal Woods Court and the area surrounding well W2125 are shown on Figure 2. The location of the shale in relation to the high pH values provided the basis for choosing the area near borehole B2025 for a targeted leachate collection pilot study.

#### 2.1.3 Bedrock Location

The area between the Pretreatment Building and Coastal Woods Court has been identified as a wetland. Previous investigations at the Site did not include this area thus the location of bedrock was unknown. A geoprobe investigation was conducted in early April of 2008 to assess the location of bedrock for design purposes. Those results which highlight the depth to bedrock can be found on Figure 1. Bedrock for those locations within the Seep 2 CKD area is shown on the boring logs in Appendix C.

#### 2.1.4 Pumping Test and Drawdown Calculations

Short-duration vertical pumping tests were conducted at W2125 to evaluate the potential for installing the targeted leachate collection system. The first phase was a stepped pumping test in which the pumping rate was systematically varied from 1.75 gallon per minute (gpm) to 7 gpm. The second phase consisted of pumping from the well at a constant rate of 7 gpm for 61 minutes. This short duration pumping test demonstrated that the targeted leachate collection wells could likely sustain a low flow sustained pumping rate. Results are discussed in Appendix D.

#### 2.2 Design Considerations

Design consideration for targeted leachate collection in the Seep 2 CKD Area include pump selection, well design, discharge line design, power accessibility, and site restoration.

#### 2.2.1 Pump Selection

Pump evaluation was determined based on head and flow requirements as well as its ability to withstand the corrosive nature of the leachate. Another important feature of the

selected pump is automatic dry-run protection. The depth of the leachate for recovery is approximately 60 to 62 feet below ground surface based on observations at well W2125. The target collection rate for the pilot system is 1 gpm.

The Grundfos RediFlo-3 was selected. Information on the selected pump is included in Appendix E.

#### 2.2.2 Well Design

The approximate location of the pilot study well, S2RW-01, is shown on Figure 3 and is approximately 25 feet from borehole B2025. A conceptual drawing of the well to be installed is included in Appendix F.

#### 2.2.3 Discharge Line

An evaluation was conducted to determine the best route for the discharge line to the pretreatment building. Advantages to transporting the leachate directly to the pretreatment building from the collection point in Seep 2 CKD Area include avoiding problems associated with the buildup of a precipitate in the discharge pipes from the mixing of leachate from difference sources. An evaluation was also necessary of the utilities in the vicinity of Coastal Woods Court as well as existing irrigation infrastructure in the vicinity of Seep 2 CKD Area.

The discharge line will consist of two lines each with a diameter of 4-inches for transporting leachate to the pretreatment building and two lines each with a diameter of 2-inches for communication and power. The discharge line route is shown on Figure 3.

#### 2.2.4 Power

Power will be obtained from the transformer near Lot 27. It will be run in a 2 inch pipe to the well S2RW-01.

#### 2.2.5 Restoration

Restoration will be conducted in coordination with the site property owners.

#### 2.3 Construction Considerations

The pilot study system design includes a leachate collection well and discharge line for transport of high pH leachate to the pretreatment building. Several construction techniques are assumed to be:

- Well installation using rotosonic drilling techniques
- Installation of HDPE collection pipe using both the horizontal directional drilling (HDD) and open cut techniques
- Standard techniques for connection of targeted leachate collection well piping to
  forcemain lines, cleanout manhole installation, pipe to manhole connections, and
  installation of pads for electrical services and trenching and conduit for electrical
  services.

Additional construction considerations include drilling through CKD, the location of utilities, access to power, access to the Site, health and safety and construction contingency plans.

#### 2.3.1 Drilling through CKD

Investigation-Derived Waste (IDW) generated during the pilot study implementation will include drilling cuttings composed of CKD and CKD mixed with native soils, drilling fluids, and purge water from boreholes and monitoring wells. The native soils and CKD drilling cuttings will be segregated and containerized in drums or roll-off boxes. To the extent possible, water will be decanted from the drilling cuttings. Water decanted from the drilling cuttings and water pumped or otherwise removed from the boreholes will be placed in polyethylene tanks or drums. The IDW fluids will be disposed of at an appropriate facility in accordance with applicable regulations.

#### 2.3.2 Utilities

Underground utilities are present under and adjacent to Coastal Woods Court. Development construction drawings from the 1990s were not sufficient to adequately locate the existing utilities. Utilities were field located and those locations are shown on a drawing in Appendix G. As a result of the field investigation to locate utilities, the contractor has determined that the HDD technique cannot be used to cross Coastal Woods Court. It will be necessary to perform an open cut installation to avoid impacts to existing utilities.

#### 2.3.3 Power

Power considerations for implementation of final design for Seep 2 CKD Area Augmentation were taken into account.

#### 2.3.4 Site Access

Because the residential community increases with the summer season, interaction/coordination with the local community will be necessary. Access to the site will be through a private gated entrance. Access roads consist of narrow low-speed residential roads, e.g., Coastal Woods Court. Necessary precautions will be required, especially during mobilization/demobilization.

Additional considerations will need to be made for transportation of equipment to the well installation location. Access consists of golf cart paths and is not suited for heavy equipment.

#### 2.3.5 Health and Safety

The Project Health and Safety Plan (PHASP) was approved by the U.S. EPA in a letter dated May 4, 2005. The PHASP documents the potential hazards associated with the Site. The PHASP will be used to ensure that work conducted at the Site is completed safely and also help to ensure that any authorized visitors to the Site are aware of the potential risks.

#### 2.3.6 Contingency Plan during Construction

Contingency actions are provided for specific measures that will be taken to promptly and appropriately address circumstances and events that pose a substantial threat to the continuing integrity and protectiveness of the remedy. Contingencies related to the construction of the targeted leachate collection system and the corrective actions intended to address those contingencies are outline below.

While previous investigations have identified that the route chosen for the HDD will not encounter bedrock or debris, there still remains a risk that unknown bedrock or debris will be encountered. In the event that this occurs it may be necessary to back up the HDD equipment and steer around the obstruction.

Field locations of the utilities in the vicinity of Coastal Woods Court have identified the need to use the open cut construction technique to cross the road in order to install the discharge line. There remains a risk that unknown utilities may be encountered. In the event that unknown utilities are encountered, it will be necessary to reroute the discharge line to avoid any impacts to existing infrastructure.

HDD is a construction technique that typically installs buried utilities with minimum environmental impact. There is a risk that drilling mud could be inadvertently released to the surface during construction. Inadvertent releases to upland areas can be contained to prevent further movement of mud. In this event containment equipment will be used and may include equipment such as hay bales, silt fences, and plastic sheeting. Inadvertent releases to a wetland area require that drilling operations be suspended. The discharge will then be evaluated and appropriate response and containment measures will be utilized. In the event that hand placed barriers cannot be used, the excess mud will be held within a containment area. It will then be removed using pumps or other appropriate measures. The mud will be disposed of at an approved disposal facility.

#### 2.4 Operation and Maintenance Considerations

The Order requires that CMS perform operation and maintenance of the interim recovery system until such time as long-term remedial alternatives can be designed and constructed and demonstrated to be effective to prevent CKD leachate releases to lakeshore areas and surface waters. Operation and maintenance of the targeted leachate collection consists of periodic monitoring of the system. Monitoring locations, parameters, event frequency, and reporting, will be defined during the pilot study and will be consistent with the AOC. Based on the results of the monitoring, a schedule for maintenance will be determined. The experience of maintaining the existing interim leachate recovery system at the Site indicates it may be necessary to perform routine removal of the precipitate formed within the discharge lines. This is conducted by physical impingement with high pressure water ("jetting"). Locations for cleanout of the discharge line have been identified on Figure 3. Detailed design is also include on the drawings in Appendix B. In addition, because of the corrosive nature of the leachate it

will be necessary to monitor pump performance within well S2RW-01. Maintenance will be performed on the pump as necessary.

#### 2.5 Schedule

Construction is scheduled to be completed by May 31, 2008. Construction is scheduled to begin as soon as all necessary approvals have been received and contractors have been procured.

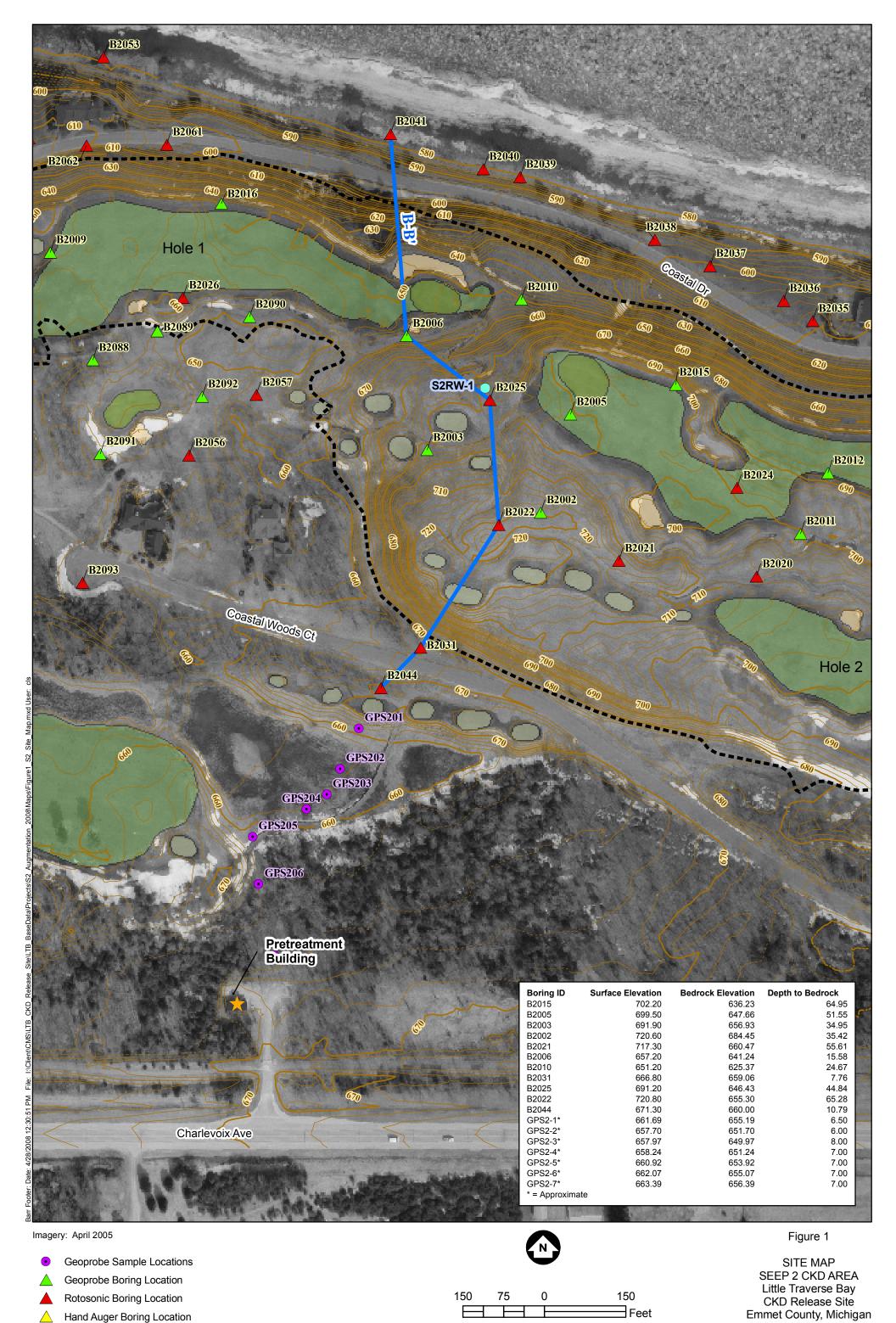
Pine Court Targeted Leachate Collection milestones and completion dates as indicated by the U.S. EPA letter to CMS Energy on April 8, 2008 are as follows:

- Phase 1 Pilot System Design completion by May 1, 2008,
- Phase 2 Pilot System Construction completion by May 31, 2008,
- Phase 3 Final Design Investigation completion by May 31, 2008,
- Phase 4 Final Design Data Evaluation completion by July 31, 2008,
- Phase 5 Final Design completion by August 31, 2008,
- Phase 6 Initiation of Final Design Construction by September 1, 2008,
- Project Completion by November 30, 2008.

#### 3.0 References

- Barr Engineering Company, 2005a. Project Health and Safety Plan Revision 4.0 (August 31, 2005), and Revision 5.0 (May 1, 2006) as amended, Little Traverse Bay CKD Release Site, Emmet County, Michigan, prepared for CMS Land Company.
- Barr Engineering Company, 2008. Removal Action Investigation/Remedial Investigation Report – West, Seep 2, and Seep 1 CKD Areas, Little Traverse Bay CKD Release Site, Emmet County, Michigan, March 1, 2008.
- U.S. Environmental Protection Agency Region 5, February 22, 2005. Administrative Order on Consent for Removal Action, Little Traverse Bay CKD Release Site, Emmet County, Michigan, Docket No. VW-05-C-810.

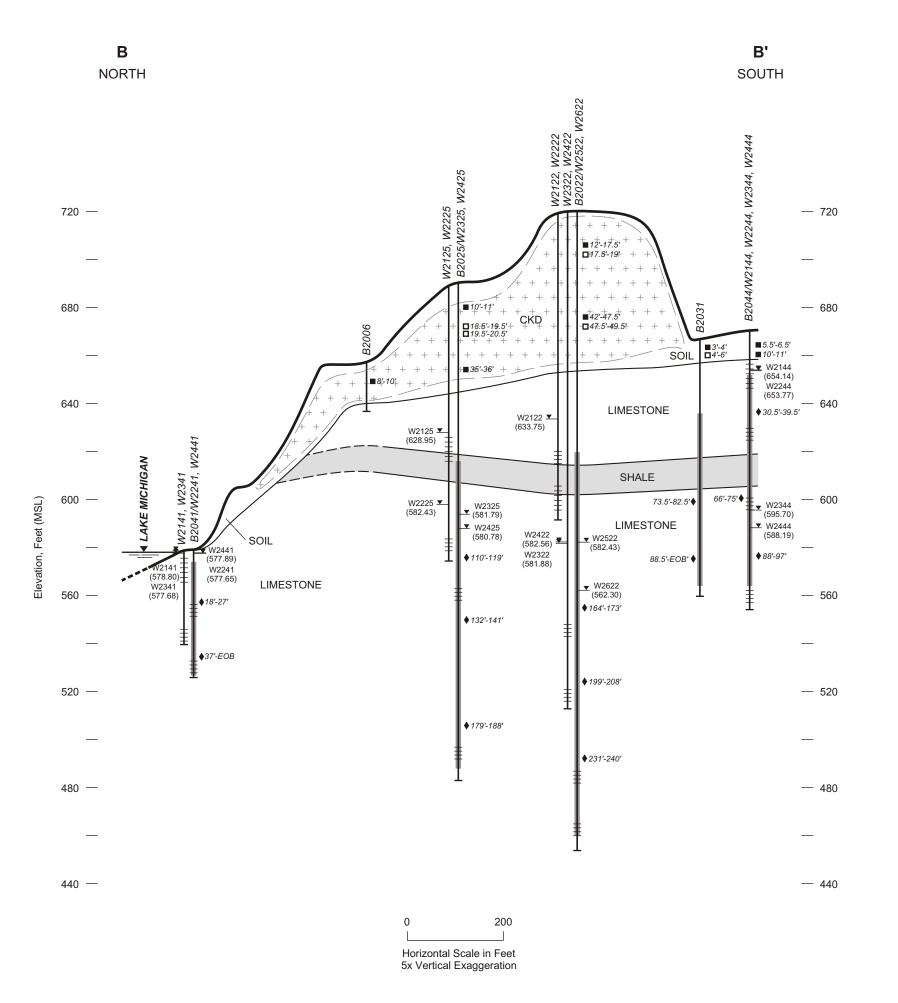
# **Figures**

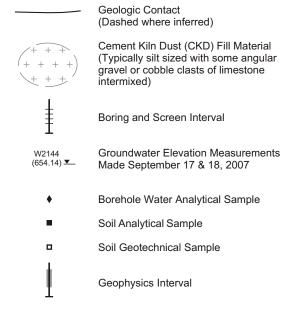


Pretreatment Building

Approximate CKD Extent

Emmet County, Description 
BARR





#### SOIL

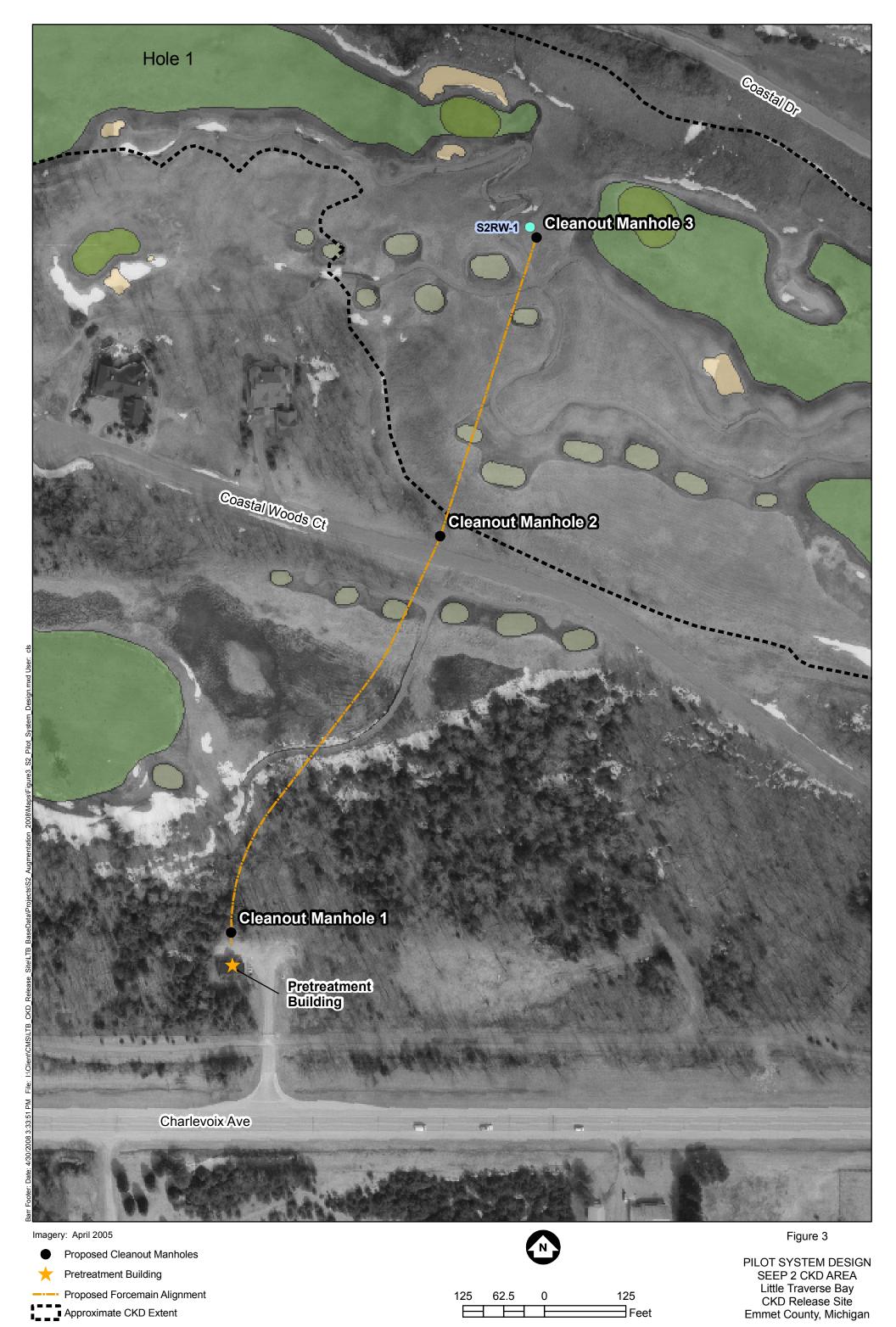
Generally topsoil consisting of variable amounts of sand, silt, and gravel. Plant organic matter is sometimes observed.

#### **LIMESTONE**

Fractured Limestone with some Discontinuous Shaley and Silty Zones.

Figure 2

GEOLOGIC CROSS SECTION B-B'
SEEP 2 AREA
Little Traverse Bay
CKD Release Site
Emmet. County, Michigan



BARR

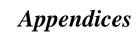
### **Tables**

Table 1 **Summary of Water Elevations** Well Nest at B2025
CMS Land Company, Bay Harbor

	CMS Land Company, Bay Harbor											
Well	Date	Ground Elevation (ft. MSL)	Top of Riser Elevation (ft. MSL)	Top of Screen Elevation (ft. MSL)	Bottom of Screen Elevation (ft. MSL)	Water Level (ft.)	Water Elevation (ft. MSL)					
W2125	4/2/2006	691.2	691.04	626.24	616.24	62.19	628.85					
W2125	7/11/2006	691.2	691.04	626.24	616.24	61.04	630.00					
W2125	8/1/2006	691.2	691.04	626.24	616.24	61.89	629.15					
W2125	8/16/2006	691.2	691.04	626.24	616.24	61.86	629.18					
W2125	9/14/2006	691.2	691.04	626.24	616.24	62.09	628.95					
W2125	10/10/2006	691.2	691.04	626.24	616.24	62.00	629.04					
W2125	10/18/2006	691.2	691.04	626.24	616.24	61.05	629.99					
W2125	11/8/2006	691.2	691.04	626.24	616.24	61.34	629.70					
W2125	1/4/2007	691.2	691.04	626.24	616.24	61.25	629.79					
W2125	1/17/2007	691.2	691.04	626.24	616.24	61.38	629.66					
W2125	2/19/2007	691.2	691.04	626.24	616.24	61.87	629.17					
W2125	3/28/2007	691.2	691.04	626.24	616.24	61.39	629.65					
W2125	5/2/2007	691.2	691.04	626.24	616.24	61.87	629.17					
W2125	5/30/2007	691.2	691.04	626.24	616.24	61.87	629.17					
W2125	6/29/2007	691.2	691.04	626.24	616.24	61.99	629.05					
W2125	8/1/2007	691.2	691.04	626.24	616.24	62.08	628.96					
W2125	9/18/2007	691.2	691.04	626.24	616.24	62.09	628.95					
W2125	10/26/2007	691.2	691.04	626.24	616.24	61.72	629.32					
W2125	11/26/2007	691.2	691.04	626.24	616.24	61.85	629.19					
W2125	11/28/2007	691.2	691.04	626.24	616.24	61.72	629.32					
W2125	1/10/2008	691.2	691.04	626.24	616.24	61.38	629.66					
W2125	4/15/2008	691.2	691.04	626.24	616.24	60.72	630.32					
W2225	4/2/2006	691.2	691.03	583.53	578.53	91.18	599.85					
W2225	7/11/2006	691.2	691.03	583.53	578.53	107.04	583.99					
W2225	8/3/2006	691.2	691.03	583.53	578.53	107.20	583.83					
W2225	8/16/2006	691.2	691.03	583.53	578.53	108.76	582.27					
W2225	9/14/2006	691.2	691.03	583.53	578.53	108.95	582.08					
W2225	10/10/2006	691.2	691.03	583.53	578.53	106.11	584.92					
W2225	10/18/2006	691.2	691.03	583.53	578.53	99.49	591.54					
W2225	11/8/2006	691.2	691.03	583.53	578.53	95.00	596.03					
W2225	1/4/2007	691.2	691.03	583.53	578.53	92.96	598.07					
W2225	1/18/2007	691.2	691.03	583.53	578.53	94.08	596.95					
W2225	2/19/2007	691.2	691.03	583.53	578.53	97.56	593.47					
W2225	3/28/2007	691.2	691.03	583.53	578.53	94.58	596.45					
W2225	5/2/2007	691.2	691.03	583.53	578.53	94.41	596.62					
W2225	5/30/2007	691.2	691.03	583.53	578.53	101.90	589.13					
W2225	6/29/2007	691.2	691.03	583.53	578.53	107.00	584.03					
W2225	8/1/2007	691.2	691.03	583.53	578.53	108.74	582.29					
W2225	9/18/2007	691.2	691.03	583.53	578.53	108.60	582.43					
W2225	10/26/2007	691.2	691.03	583.53	578.53	102.01	589.02					
W2225	11/26/2007	691.2	691.03	583.53	578.53	98.91	592.12					
W2225	11/28/2007	691.2	691.03	583.53	578.53	98.88	592.15					
W2225	1/10/2008	691.2	691.03	583.53	578.53	96.15	594.88					
W2225	4/15/2008	691.2	691.03	583.53	578.53	90.35	600.68					

Table 1 **Summary of Water Elevations** Well Nest at B2025
CMS Land Company, Bay Harbor

	CMS Land Company, Bay Harbor											
Well	Date	Ground Elevation (ft. MSL)	Top of Riser Elevation (ft. MSL)	Top of Screen Elevation (ft. MSL)	Bottom of Screen Elevation (ft. MSL)	Water Level (ft.)	Water Elevation (ft. MSL)					
W2325	4/2/2006	691.2	690.85	563.13	558.13	91.07	599.78					
W2325	7/11/2006	691.2	690.85	563.13	558.13	106.75	584.10					
W2325	8/1/2006	691.2	690.85	563.13	558.13	109.50	581.35					
W2325	8/16/2006	691.2	690.85	563.13	558.13	108.65	582.20					
W2325	9/14/2006	691.2	690.85	563.13	558.13	109.27	581.58					
W2325	10/10/2006	691.2	690.85	563.13	558.13	106.85	584.00					
W2325	10/18/2006	691.2	690.85	563.13	558.13	99.23	591.62					
W2325	11/8/2006	691.2	690.85	563.13	558.13	95.79	595.06					
W2325	1/4/2007	691.2	690.85	563.13	558.13	92.82	598.03					
W2325	1/17/2007	691.2	690.85	563.13	558.13	93.91	596.94					
W2325	2/19/2007	691.2	690.85	563.13	558.13	97.42	593.43					
W2325	3/28/2007	691.2	690.85	563.13	558.13	94.40	596.45					
W2325	5/2/2007	691.2	690.85	563.13	558.13	94.30	596.55					
W2325	5/30/2007	691.2	690.85	563.13	558.13	101.76	589.09					
W2325	6/29/2007	691.2	690.85	563.13	558.13	106.91	583.94					
W2325	8/1/2007	691.2	690.85	563.13	558.13	110.55	580.30					
W2325	9/18/2007	691.2	690.85	563.13	558.13	109.06	581.79					
W2325	10/26/2007	691.2	690.85	563.13	558.13	101.81	589.04					
W2325	11/26/2007	691.2	690.85	563.13	558.13	98.78	592.07					
W2325	11/28/2007	691.2	690.85	563.13	558.13	98.73	592.12					
W2325	1/10/2008	691.2	690.85	563.13	558.13	95.98	594.87					
W2325	4/15/2008	691.2	690.85	563.13	558.13	90.48	600.37					
W2425	4/2/2006	691.2	691.02	496.46	491.46	101.14	589.88					
W2425	7/11/2006	691.2	691.02	496.46	491.46	118.51	572.51					
W2425	8/3/2006	691.2	691.02	496.46	491.46	118.25	572.77					
W2425	8/16/2006	691.2	691.02	496.46	491.46	118.97	572.05					
W2425	9/14/2006	691.2	691.02	496.46	491.46	115.38	575.64					
W2425	10/10/2006	691.2	691.02	496.46	491.46	107.20	583.82					
W2425	10/19/2006	691.2	691.02	496.46	491.46	104.45	586.57					
W2425	11/8/2006	691.2	691.02	496.46	491.46	102.42	588.60					
W2425	1/4/2007	691.2	691.02	496.46	491.46	100.87	590.15					
W2425	1/18/2007	691.2	691.02	496.46	491.46	101.16	589.86					
W2425	2/19/2007	691.2	691.02	496.46	491.46	102.55	588.47					
W2425	3/28/2007	691.2	691.02	496.46	491.46	102.30	588.72					
W2425	5/2/2007	691.2	691.02	496.46	491.46	99.74	591.28					
W2425	5/30/2007	691.2	691.02	496.46	491.46	107.27	583.75					
W2425	6/29/2007	691.2	691.02	496.46	491.46	111.77	579.25					
W2425	8/1/2007	691.2	691.02	496.46	491.46	116.88	574.14					
W2425	9/18/2007	691.2	691.02	496.46	491.46	110.24	580.78					
W2425	10/26/2007	691.2	691.02	496.46	491.46	103.60	587.42					
W2425	11/26/2007	691.2	691.02	496.46	491.46	103.11	587.91					
W2425	11/28/2007	691.2	691.02	496.46	491.46	102.87	588.15					
W2425	1/10/2008	691.2	691.02	496.46	491.46	102.27	588.75					
W2425	4/15/2008	691.2	691.02	496.46	491.46	100.54	590.48					



# Appendix A

Work Plan for Design Investigation

# Design Investigation Activities April 16, 2008 Little Traverse Bay CKD Release Site Emmet County, Michigan

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Figure 1 Design Investigation Location – Seep 2 Area

#### 1.0 Introduction

This Design Investigation Activities document was prepared to describe design investigation activities to be conducted at the Little Traverse Bay CKD Release Site (Site). Significant investigation activities have already been completed at the Site pursuant to the Removal Action Work Plan for the Little Traverse Bay CKD Release Site, Emmet County, Michigan (Barr, 2005a). The activities presented in this document are intended to provide information necessary for the design of a Targeted Leachate Collection (TLC) system at the Seep 2 CKD area.

The work will be completed according to the Site-specific Quality Assurance Project Plan – Revision 1.0 dated April 26, 2005 (QAPP) (Barr, 2005b), the Project Health and Safety Plan – Revision 5.0 dated May 1, 2006 (PHASP) (Barr, 2006a), and the Site Control and Access Management Plan – Revision 1.0 dated April 4, 2005 (SCAMP) (Barr, 2005c) prepared for the Site. These plans have been approved by the U.S. EPA. In addition, all investigation and related work will be completed according to Barr's Quality Management Plan (QMP) for Data Collection and Management of Contaminated Site Assessment and Remediation Projects (Barr, October 3, 2003).

Design investigation activities are planned for the Seep 2 Area of the Site, near Borehole B2025. Planned activities for this location include installation of rotasonic bedrock boreholes in the vicinity of Borehole B2025 in order to define the shale geometry in this area and obtain pH profiling data in the boreholes. Installation of TLC wells will be considered in boreholes with high pH values, to facilitate the collection of leachate at the point of generation. The details of the activities are in Section 2.0 of this document.

Concurrent with Design Investigation Activities for the Seep 2 Area, is an effort to implement a TLC Pilot Study at one location near Borehole B2025.

#### 1.1 Final Approved Removal Action Work Plan

The following sections of the Final Approved Removal Action Work Plan (Barr, 2005a) contain field methods and procedures that will be generally followed during the implementation of the investigation activities described in this document:

5.2.1 Topographical Surveys – boring and TLC well locations and elevations will be surveyed.

- 5.2.4 Hydrogeological Investigations borings will be installed at selected locations to obtain information on groundwater quality. No monitoring wells will be installed at any location.
- 5.2.4.2 Bedrock Characterization NOTE: No angled borings will be installed as described in this section. Vertical borings will be used to characterize bedrock.
- 5.2.9 Management and Disposal of Investigation-Derived Waste IDW will be managed as described in this section.
- 5.3 Sample Analysis Note: No additional CKD, unconsolidated materials, or bedrock core samples will be analyzed for either chemical analysis or physical properties. No further organics (VOCs or SVOCs) sampling will be performed. Only pH profiling data will be collected from the boreholes.
- 5.4 Analytical Support and Data Validation Methods and procedures used during the Removal Action Investigation will be employed.
- 5.5 Provide Electronic Data in U.S. EPA Format Methods and procedures used during the Removal Action Investigation will be employed.
- 5.6 Data Evaluation and Reporting Methods and procedures used during the Removal Action Investigation will be employed.

#### 1.2 Objectives

The overall objective for the design investigation activities is to provide necessary data to characterize areas of the Site for the evaluation and design of a TLC system.

The specific objective of the Design Investigation Activities described in this document is to define the geometry of the shale unit and obtain pH profiling data of groundwater perched above the shale unit in boreholes installed in the vicinity of Borehole B2025 in the Seep 2 Area.

The purpose of obtaining this information is to install a TLC well system, to collect leachate at the point of generation, which in turn will prevent its migration to the beach in the Pine Court area. Previous remedial investigation activities have shown that collecting the leachate at the point of generation is an effective method to prevent its migration to the beach.

#### 2.0 Planned Scope of Work

Design investigation activities are planned for the Seep 2 area of the Site, near Borehole B2025. Figure 1 depicts the Seep 2 Area, the locations of soil borings conducted as part of the Final Approved Removal Action Work Plan (Barr, 2005a), and the location of planned Seep 2 Area design investigation activities.

The following activities are planned for the Seep 2 Area:

- 1.) A TLC well will be installed approximately 25 feet from Borehole B2025. This well will be used as the TLC Pilot Study well. Details on this TLC well as well as the entire design for the TLC Pilot Study will be submitted in the Seep 2 CKD Area Augmentation Conceptual Design Report, Targeted Leachate Collection Pilot Study.
- 2.) Installation of a rotasonic bedrock borehole within 100 feet west of Borehole B2025. The borehole will be drilled to a depth till the top of the shale unit is reached. The purpose of the borehole will be to facilitate collection of pH profiling data. If the pH profiling data indicates high pH values similar to the pH values encountered in Borehole B2025, another rotasonic bedrock borehole will be installed further west of the first borehole. This procedure will be continued until pH profiling data in a borehole indicates lower pH values when compared to the pH values in Borehole B2025 and the new boreholes installed in its vicinity. The lower pH values would be an indicator of the absence of leachate perched on top of the shale unit and therefore, installing additional boreholes further west will not be necessary.
- 3.) Installation of a TLC well will be considered in the borehole having the highest pH values, as indicated by the pH profiling data. The purpose of this well will be to allow pumping out the leachate, for treatment (neutralization) at the treatment building.
- 4.) The above procedure will be followed for installing rotasonic bedrock boreholes to the north, south and east of Borehole B2025 and installation of TLC wells will be considered, as appropriate, in boreholes with the highest pH values as indicated by the pH profiling data.
  - Overall, the Site topography and drill rig accessibility will be taken into consideration when determining the exact locations for the installation of the boreholes. Additionally, the fairway areas will be avoided when installing a borehole.

#### 3.0 Schedule

Drilling activities are scheduled to commence the week of April 21, 2008, when one rotasonic drilling rig will be mobilized to the site. Rotasonic drilling is expected to last for approximately 2 weeks.

Seep 2 Targeted Leachate Collection milestones and completion dates as indicated by the US EPA letter to CMS Energy on April 8, 2008 are as follows:

- Phase 1 Pilot System Design completion by May 1, 2008,
- Phase 2 Pilot System Construction completion by May 31, 2008,
- Phase 3 Final Design Investigation completion by May 31, 2008,
- Phase 4 Final Design Data Evaluation completion by July 31, 2008,
- Phase 5 Final Design completion by August 31, 2008,
- Phase 6 Initiation of Final Design Construction by September 1, 2008,
- Project Completion by November 30, 2008.

#### 4.0 References

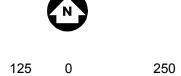
- Barr Engineering Co. (Barr), 2003. Quality Management Plan for Data Collection and Management of Contaminated Site Assessment and Remediation Projects. Revision 1.0. October 3, 2003.
- Barr Engineering Company, 2005a. Final Approved Removal Action Work Plan, July 28, 2005 Little Traverse Bay CKD Release Site, Emmet County, Michigan, prepared for CMS Land Company.
- Barr Engineering Co. (Barr), 2005b. Quality Assurance Project Plan Revision 1.0 Little Traverse Bay CKD Release Site, Emmet County, Michigan, prepared for CMS Land Company.
- Barr Engineering Company, 2005c. Site Control and Access Management Plan Revision 1.0, Little Traverse Bay CKD Release Site, Emmet County, Michigan, prepared for CMS Land Company.
- Barr Engineering Company, 2006a. Project Health and Safety Plan Revision 5.0, May 1, 2006, Little Traverse Bay CKD Release Site, Emmet County, Michigan, prepared for CMS Land Company.
- U.S. Environmental Protection Agency Region 5, February 22, 2005. Administrative Order on Consent for Removal Action, Little Traverse Bay CKD Release Site, Emmet County, Michigan, Docket No. VW-05-C-810.



▲ Geoprobe Boring Location
 ▲ Rotosonic Boring Location
 ▲ Hand Auger Boring Location
 ▲ Approximate CKD Extent

Proposed Boring Area
Fairway
Green
Sand

Tee Boxes



∃Feet

250

DESIGN INVESTIGATION LOCATION SEEP 2 CKD AREA Little Traverse Bay CKD Release Site Emmet County, Michigan



# Appendix B

Seep 2 Augmentation Pilot Design Drawings

# CMS LAND COMPANY LITTLE TRAVERSE BAY CKD RELEASE SITE SEEP 2 AUGMENTATION EMMET COUNTY, MICHIGAN



# LOCATION MAP



VICINITY MAP

THREE FULL WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG

#### WARNING

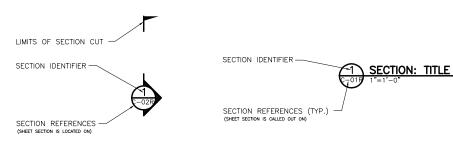
UTILITY LOCATIONS ARE APPROXIMATIONS SHOWN WERE OBTAINED FRO

#### INDEX

SHEET NO.	<u>TITLE</u>
C-01	. Seep 2 Augmentation — Title Sheet, Index, and Site Location Map
C-02	. Seep 2 Augmentation — Forcemain Plan & Profile Sta. 1+50 to 7+50
C-03	. Seep 2 Augmentation — Forcemain Plan & Profile Sta. 7+50 to 13+33
C-04	. Seep 2 Augmentation — Forcemain Sections & Details
E-01	. Seep 2 Augmentation — Electrical Plan & Details

#### **PROJECT NOTES:**

1. ALL WORK SHALL BE CONDUCTED IN ACCORDANCE WITH THE SITE HEALTH AND SAFETY PLAN, REVISION 5 (MAY 1, 2006).

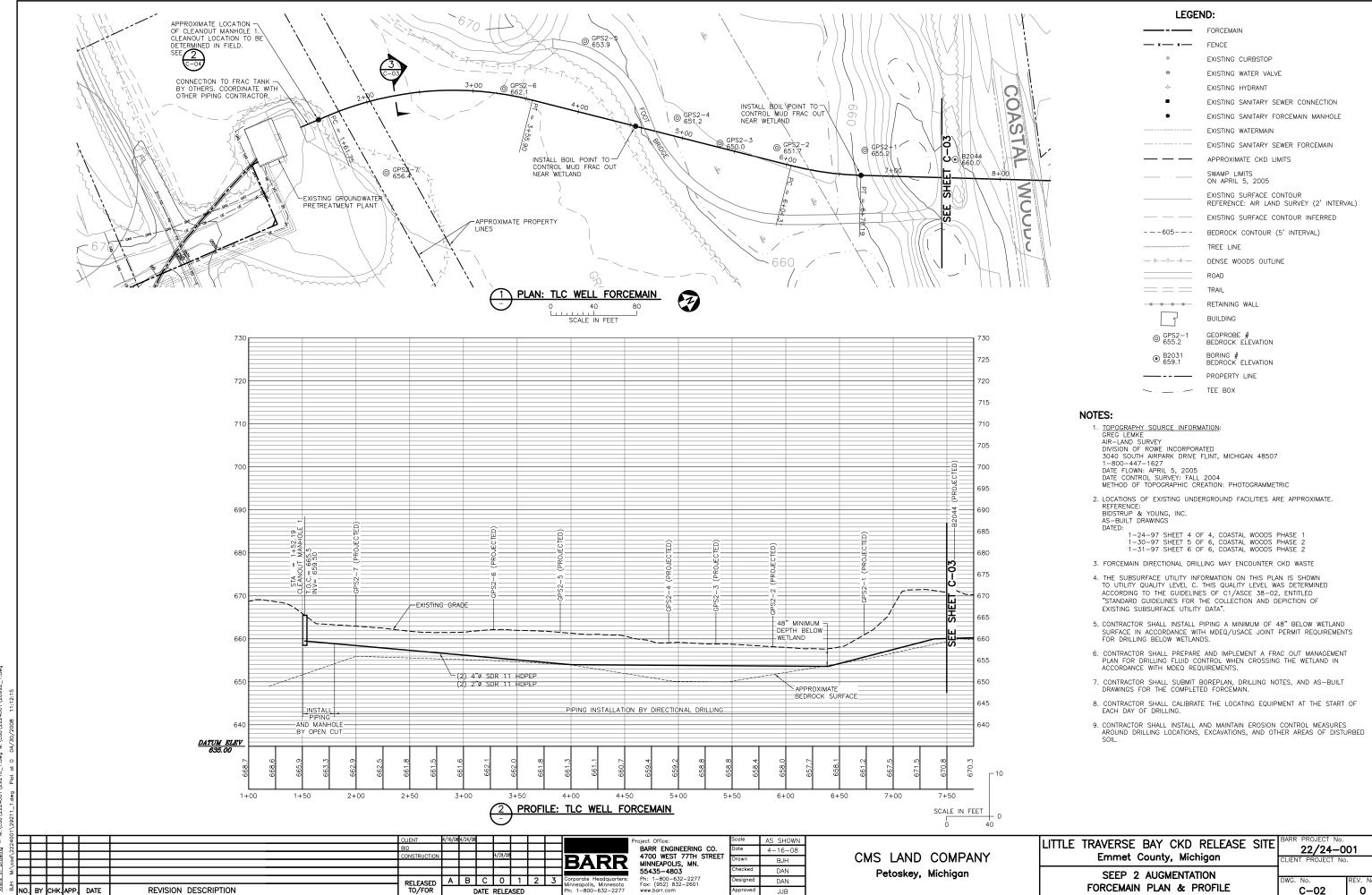


SECTION VIEW CALL OUT

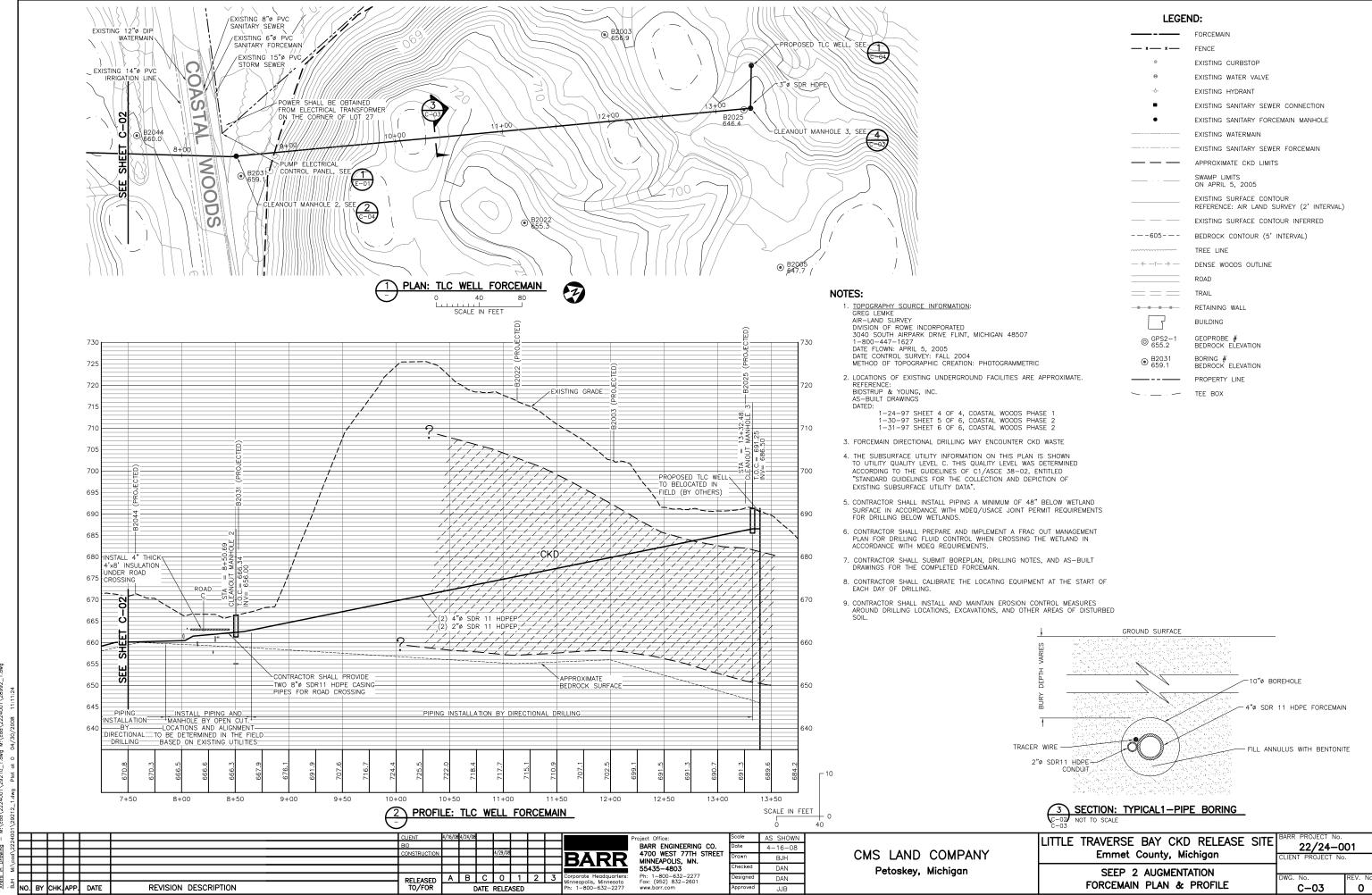
SECTION VIEW TITLE

40	$\perp$				CLIENT	4/24/08		$\perp$			Project Office:	Scale	AS SHOWN		LITTLE TRAVERSE BAY CKD RELEASE SITE	BARR PROJECT No.
- 12 K	+	$\rightarrow$			BID		4/2	9/08			BARR ENGINEERING CO.	Date	4-23-08			22/24-001
86 L	+	$\rightarrow$			CONSTRUCTION		—		_		4700 WEST 77TH STREET	Drawn	B.IH	CMS LAND COMPANY	Emmet County, Michigan	CLIENT PROJECT No.
ارة ا	+	$\rightarrow$					$\vdash$	$\dashv$	_	JDAKR	MINNEAPOLIS, MN.	Checked	DOTT			32.2.11 T 11.33231 T13.
໘ ≥ 📙	+	$\rightarrow$					<b>.</b>				55435-4803 rs: Ph: 1-800-632-2277	Officered	DAN	Petoskey, Michigan	SEEP 2 AUGMENTATION	
ğı L	+	$\rightarrow$			RELEASED	AB		)   1	2 3	Minneapolis, Minnesoto	rs: Pn: 1-800-632-2277 rs: Fax: (952) 832-2601	Designed	DAN	· •		DWG. No. REV. No.
ᆁᆲᆫ	o. By C	CHK. APP.	DATE	REVISION DESCRIPTION	TO/FOR		DATE RE	LEASED		Ph: 1-800-632-227	7 www.barr.com	Approved	JJB		TITLE SHEET, INDEX, AND SITE LOCATION MAP	C-01 0

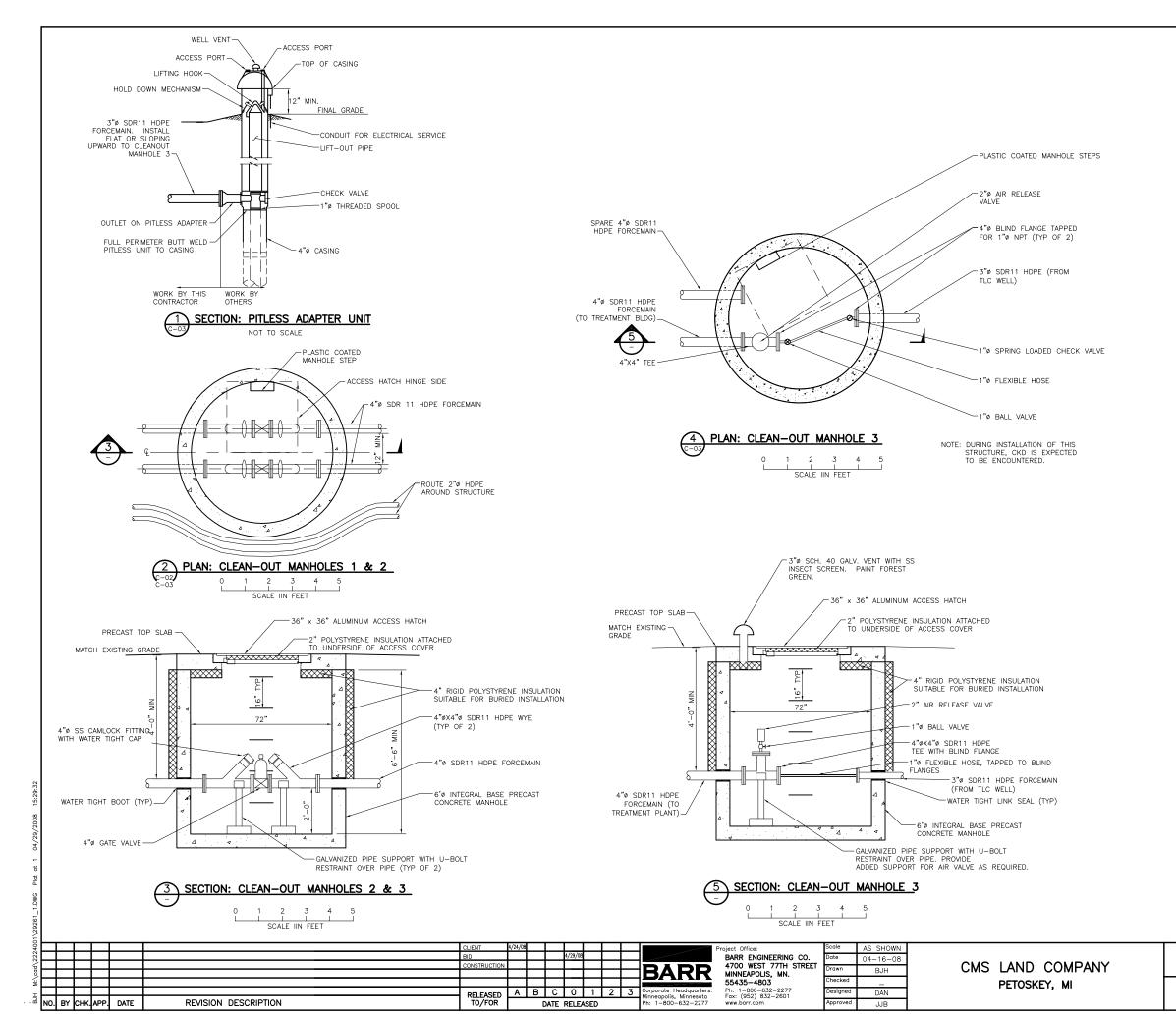
nForCad.jpg M:\cad\2224001\CAD\_Ref.jpg 04/30/2008 11:17:07



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n Hughes FILE: M:\CAD\2224001\29212\_1.DWG PLOI SCALE: 1:2 PLOI DAIE: 4/30/2008\_11:16 - M:\cad\2224001\29210\_1.dwg M:\cad\2224001\28992\_1.dwg



#### EXECUTION:

OVEREXCAVATE FOR STRUCTURES TO MIN. 6 INCHES BELOW BASE, PLACE STRUCTURE ON MDOT DENSE GRADED AGGREGATE 22A, COMPACTED PER TABLE BELOW.

BACKFILL WITH MAX. 8" LIFTS USING NATIVE MATERIAL OR IMPORTED BACKFILL CONFORMING TO MDOT CLASS I IMPORT, COMPACTED PER TABLE BELOW

BED PIPES ON CLEAN SAND WITH 100% PASSING THE 3/8" SIEVE AND NO MORE THAN 10% PASSING THE NO. 100 SIEVE, COMPACTED PER TABLE BELOW.

COMPACT TO THE FOLLOWING MINIMUM DENSITIES:

LOCATION	DEHSITY
UNDER STRUCTURES	98% OF MAX.
TOP 2 FEET UNDER PAVEMENT AND GRAVEL ROADS, DRIVES AND PARKING	98% OF MAX.
BELOW TOP 2 FEET UNDER PAVEMENT AND GRAVEL ROADS, DRIVES AND PARKING	90% OF MAX.
PIPE BEDDING	95% OF MAX.
TRENCHES THROUGH UNPAVED AREAS AND FILL AREAS	90% OF MAX.
BESIDE STRUCTURE WALLS	90% OF MAX.

MAXIMUM DENSITY: ASTM D698 - MOISTURE-DENSITY RELATIONS OF SOILS AND SOIL-AGGREGATE MIXTURES USING 5.5 LB (2.49 KG) RAMMER AND 124N. (305MM)DROP (ALSO REFERRED TO AS STANDARD PROCTOR). MOISTURE CONTENT AT -0%+2% OF OPTIMUM.

HYDROSTATIC PRESSURE TEST ALL PIPE TO 50 PSI FOR 2 HOURS PER PIPE MANUFACTURER'S RECOMMENDATIONS.

RESTORATION OF GOLF COURSE AREAS TO BE COMPLETED BY OTHERS. ALL AREAS DISTURBED FOR CONSTRUCTION SHALL BE RESTORED IN KIND. ALL AREAS DISTURBED BY EXCAVATION SHALL BE RESTORED TO THE EXISTING GRADES.

LITTLE TRAVERSE BAY CKD RELEASE SITE EMMET COUNTY, MI

BARR PROJECT No.

22/24-001

CLIENT PROJECT No.

SECTIONS AND DETAILS

DWG. No. REV. No.

# Appendix C

Monitoring Well Logs and Boring Logs

Client CMS Land Company			Drill Contractor WELL CONSTRUCTION B2022/W2122 W2222 W2322 W2422  SHEET 1 OF 8									
l –	Name Little Traverse Bay CKD Release Site			Rotasonic			SHEE	T 1 OF 8				
Number	22/24-001	Drilling Started 1/17/06 Ended 2/2/06 Original Borehole Ele					Borehole Elevation 720.8	Flevation 720.8 ft				
Location	Location Petoskey, MI		By _	SKF, HAW		_	pth 267.5 ft					
							<u> </u>	1				
Depth, Feet	DESCRIPTION	Graphic Log	00707	W2122 W2222	WELL CONSTRUCTION  — Ground elevation	W2322 W2422	WELL CONSTRUCTION  — Ground elevation	Elevation, Feet				
5— 10— 15— 20— 25— 30—	0-1': Topsoil, light brown with organic roots.  1-7.5': Silty sand CKD, grayish brown, with subrounded pebbles. Light gray sand included from 2-3' (CKD) gravel/sand/fine=20/60/20%  7.5-17.5': Silty sand CKD, grayish brown, with subrounded pebbles, 15% light gray sand. gravel/sand/fine=20/60/20%  17.5-37.5': Silty sand CKD, grayish brown, with subrounded pebbles. gravel/sand/fine=10/60/30%  24-25.5': Includes broken angular mudstone pebbles.			WEST CONTROLLED TO THE CONTROL	— Ground elevation 720.8 ft  — Riser elevation W2122 720.36 ft, W2222 720.29 ft  — Borehole diameter 6"; 2" diameter Sch 40 PVC riser  — Neat cement grout		— Ground elevation 720.8 ft — Riser elevation W2322 720.39 ft, W2422 720.50 ft  ■ Borehole diameter 6"; 2" diameter; W2322: Sch 40 PVC riser; W2422: Type 304 stainless steel riser  ■ Neat cement grout	- 720 715 710 705 700 700 700				
_								690 - - -				



35

Barr Engineering Co. 4700 West 77th Street Minneapolis, MN 55435 Telephone: 1-800-632-2277 Fax: 952-832-2601 Remarks Wells W2522 and W2622 are located in an adjacent borehole

Wells W2322 and W2422 are located in an adjacent borehole.

(continued)

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Additional data may have been collected in the field which is not included on this log.

Client (	CMS Land Company	Drill Co	ontractor Prosoni	L CONSTRUCTIO	N B2022/W2122 W2222 W2322 V	N2422		
Project N	lame Little Traverse Bay CKD Release Site		ethod Rotasonic		SHEE!	Γ 2 OF 8		
Number	22/24-001	Drilling	Started _1/17/06	Ended _2/2/06	— Original Borehole Elevation 720.8 ft			
Location	Petoskey, MI	Logged	By SKF, HAW		Total Depth 267.5 ft			
Depth, Feet	DESCRIPTION	Graphic Log	W2122 W2222	WELL CONSTRUCTION	WELL WELL	Elevation, Feet		
_	17.5-37.5': Silty sand CKD, grayish brown, with subrounded pebbles. gravel/sand/fine=10/60/30%(continued)  37.5-47.5': Silty sand CKD, grayish brown, with subrounded pebbles. gravel/sand/fine=5/65/35%					685 - -		
40 — - - -	40-46': Has light gray (10YR5/2 to 10YR5/1) flecks throughout.					- 680 - -		
45 — - -	47.5-63.5" Silty sand CKD, grayish brown, with			- Neat cement grout	Neat cement grout	- 675 -		
50 — - - -	subrounded pébbles. gravel/sand/fine=5/65/35%					- - 670 - -		
55 — - - -						- 665 - -		
60 — - - -	_63.5-64': Organic rich topsoil.					- 660 -		
	_ υσ.σ-υ+ . Organic non topsoil.	1.1.1.1				Г		

BARR

65

70

pebbles.

grained, massive.

Barr Engineering Co. 4700 West 77th Street Minneapolis, MN 55435 Telephone: 1-800-632-2277 Fax: 952-832-2601

64-65': Sand, fine to medium grained, well graded.

66-67.5': Weathered bedrock, limestone, silt, and

67.5-77.5': Limestone bedrock, fossiliferous, fine

65-66': Silty sand with pebbles and cobbles.

69-70': Limestone has brown silty sand.

Remarks Wells W2522 and W2622 are located in an adjacent borehole

Wells W2322 and W2422 are located in an adjacent borehole.

Hydrated bentonite

(continued)

chips

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

Hydrated bentonite

655

chips

See legend of boring logs for explanations of symbols used.

BARR

Barr Engineering Co. 4700 West 77th Street Minneapolis, MN 55435 Telephone: 1-800-632-2277 Fax: 952-832-2601 Remarks Wells W2522 and W2622 are located in an adjacent borehole

Wells W2322 and W2422 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client _0	Client CMS Land Company		Drill Contractor WELL CONSTRUCTION B2022/W2122 W2222 W2322 W2422  Prosonic SHEET 4 OF 8									
Project N	lame Little Traverse Bay CKD Release Site	Drill M	ethod R	otasoni	ic	_		Office	11 4 01 0			
Number	22/24-001	Drilling	Started	1/17/0	06 Ended 2/2/06	_ (	Original	Borehole Elevation 720	.8 ft			
Location	Petoskey, MI	Logge	d By _SK	F, HAV	V	_ 1	Γotal De	epth 267.5 ft				
Depth, Feet	DESCRIPTION	Graphic Log	W2122	W2222	WELL CONSTRUCTION	W2322	W2422	WELL CONSTRUCTION	Elevation, Feet			
- - - 110—	95-107': Limestone bedrock, massive, fine grained no visible fossils.(continued)  107-116': Shale (indicated by geophysics, no sample recovery).				Filter sand				615 - - -			
-			Manager of the Control		← Hydrated bentonite chips				610 			
- 115 <i>-</i> - -	116-130': Limestone bedrock, massive, fine grained, no visible fossils.				Filter sand			<ul><li>Hydrated bentonite chips</li></ul>	- 605 -			
- - 120 — - - - 125 —					—— 10' long, 2" diameter, 10 slot, Sch 40 PVC screen				- - - - - - - -			
130 —	130-197.5': Limestone, fossiliferous- including brachiopods, crinoids and coral structures, sample is broken up.				← END OF BORING - 128 feet				595    590 			
135— - - - - 140—					(continued)				- 585 - - -			
			Re	marks '	Wells W2522 and W2622 are	located	d in an a	adiacent borehole	$\overline{}$			

Wells W2322 and W2422 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client CMS Land Company			tractor	WE Proso	LL CONSTRUCTION	N B2	022	/W2	122 W2222 W2322 V	V2422	
Project N		Drill Meth							SHEET	5 OF 8	
Number	22/24-001	Drilling S	tarted	1/17/0	6 Ended <u>2/2/06</u>		— Original Borehole Elevation _720.8 ft				
Location	Petoskey, MI	Logged E	By Sk	KF, HAW	l .		Total Depth _267.5 ft				
Depth, Feet	DESCRIPTION	Graphic Log	W2122	W2222	WELL CONSTRUCTION		W2322	W2422	WELL CONSTRUCTION	Elevation, Feet	
- 145 — - - 150 — -	130-197.5': Limestone, fossiliferous- including brachiopods, crinoids and coral structures, sample is broken up.(continued) 2" Dark gray aphanitic shale lens at 140'.								─ Hydrated bentonite chips	580   575   570 	
155 — - - - 160 —										- 565 - - - - - - 560	
- 165 — - - - 170 —										- - - - 555 - - -	
- - - 175—					(continued)		· · · · · · · · · · · · · · · · · · ·		► Filter sand  5' long, 2" diameter, 10 slot, Sch 40 PVC screen	550 - - - -	

Remarks Wells W2522 and W2622 are located in an adjacent borehole

Wells W2322 and W2422 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client _0	Client CMS Land Company			Drill Contractor WELL CONSTRUCTION B2022/W2122 W2222 W2322 W242 SHEET 6 OF							
Project N	lame Little Traverse Bay CKD Release Site	Drill Meth	od R	totasonic		_	SHEE	10000			
Number	22/24-001	Drilling S	tarted	1/17/06	Ended _2/2/06	— Original Borehole Elevation _720.8 ft					
Location	Petoskey, MI	Logged B	sy SK	F, HAW		Total Depth <u>267.5 ft</u>					
Depth, Feet	DESCRIPTION	Graphic Log	W2122	W2222	WELL CONSTRUCTION	W2322 W2422	WELL CONSTRUCTION	Elevation, Feet			
- - - 180 — -	130-197.5': Limestone, fossiliferous- including brachiopods, crinoids and coral structures, sample is broken up. (continued)						—Filter sand	545    540			
185 — 190 —						4	— Hydrated bentonite chips	- - - 535 - - - - - - 530			
195 — - - - - - - 200 —	197.5-232': Limestone, fossiliferous, 5-10% fossils.						— Filter sand	- - - 525 - -			
205 —							— 5' long, 2" diameter, 1 slot, Type 304 stainless steel screen — END OF BORING - 207 feet				
210—					(continued)			<u> </u>			
			_			•					

BARR

Barr Engineering Co. 4700 West 77th Street Minneapolis, MN 55435 Telephone: 1-800-632-2277 Fax: 952-832-2601 Remarks Wells W2522 and W2622 are located in an adjacent borehole

Wells W2322 and W2422 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client CMS Land Company			Drill Contractor WELL CONSTRUCTION B2022/W2122 W2222 W2322 W2422 Prosonic SHEET 7 OF 8								
Project N	Name Little Traverse Bay CKD Release Site	Drill Me						_		SHEE	1 / OF 8
Number	22/24-001	Drilling :	Starte	ed _	1/17/06	Ended _2	2/2/06	_ (	Original B	Borehole Elevation 720.	8 ft
Location	Petoskey, MI	Logged By SKF, HAW									
Depth, Feet	DESCRIPTION	Graphic Log		W2122	W2222	WELL CONSTRUCT	TION	W2322	W2422	WELL CONSTRUCTION	Elevation, Feet
215 — - 220 —	197.5-232': Limestone, fossiliferous, 5-10% fossils. (continued)  219-220': Limestone is darker gray, fine grained, and slightly weathered.										510   505   500 
225 — 230 —	227.8-229': Weathered limestone horizontal bedding. 229-232': Limestone is vuggy.  232-237.5': Brown limestone, fossiliferous- fossils are light gray.										- - 495 - - - - - 490 -
235— 	237.5-247.5': Limestone, fossiliferous- fossils are light gray, 5% fossils.										- - - - - - - - - - - - -
- - 245—	243': 3" of laminated, moderate field strength, not fully cemented mudstone, with horizontal bedding.					(continued)	)				-



Remarks Wells W2522 and W2622 are located in an adjacent borehole

Wells W2322 and W2422 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client _0	Client CMS Land Company			Drill Contractor WELL CONSTRUCTION B2022/W2122 W2222 W2322 W24 Prosonic SHEET 8 O						
Project N	lame Little Traverse Bay CKD Release Site	Drill Meth	nod R	otasonic				Office	10010	
Number	22/24-001	Drilling S	tarted	1/17/06	Ended _2/2/06		Original E	Borehole Elevation 720.	8 ft	
Location	Petoskey, MI	Logged E	By SK	F, HAW						
Depth, Feet	DESCRIPTION	Graphic Log	W2122	W2222	WELL CONSTRUCTION	W2322	W2422	WELL CONSTRUCTION	Elevation, Feet	
-	237.5-247.5': Limestone, fossiliferous- fossils are light gray, 5% fossils.(continued)								— 475 -	
- - 250—	247.5-257.5': Calcareous mudstone.								- - - - 470	
- - - 255									- - - - 465	
- - - 260—	257.5-264': Limestone, massive, microcrystalline, secondary calcite mineralization in sub vertical fractures, moderate HCl reaction.								-	
	264-267.5': Limestone, vuggy with calcite								460  -	
265— - - -	replacement in voids, strong reaction to HCl.  END OF BORING- 267.5' bgs								- 455 - -	
270 — - - -									- 450 -	
- 275— - -									- 445 -	
280—									-	

BARR

Barr Engineering Co. 4700 West 77th Street Minneapolis, MN 55435 Telephone: 1-800-632-2277 Fax: 952-832-2601 Remarks Wells W2522 and W2622 are located in an adjacent borehole

Wells W2322 and W2422 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client (	CMS Land Company	Drill Contractor Prosonic	VELL C	ONSTRUCTION	ON B2022/W2522 \				
	Name Little Traverse Bay CKD Release Site	Drill Method Rotasonic			SHEE	T 1 OF 8			
-	22/24-001	Drilling Started 1/17/06 Ended 2	2/2/06	Oriente el F	Original Borehole Flevation 720 8 ft				
				Original Borehole Elevation 720.8 ft					
Location	Petoskey, MI	Logged By SKF, HAW	— Total Dep	Total Depth 267.5 ft					
			go-			n,			
Depth, Feet	DESCR	RIPTION	Graphic Log	9 9	WELL CONSTRUCTION	Elevation, Feet			
۵۳			Grap	W2522 W2622		Ele			
	0-1': Topsoil, light brown with organic roots.			888	— Ground elevation 720.8 ft	<b>—</b> 720			
-	1-7.5': Silty sand CKD, grayish brown, with subroutight gray sand included from 2-3' (CKD)	unded pebbles.			<ul><li>Riser elevation</li><li>W2522 720.53 ft,</li></ul>	_ /20			
	gravel/sand/fine=20/60/20%				W2622 720.52 ft	-			
_					Borehole diameter 6";	-			
5—					2" diameter type 304 stainless steel riser	-			
_						<del> 715</del>			
-	7.5-17.5': Silty sand CKD, grayish brown, with sul	prounded pebbles 15% light gray sand							
_	gravel/sand/fine=20/60/20%	orounded peobles, 1070 light gray sand.							
10 —					— Neat cement grout	<u> </u>			
-					rtoat oomont groat	<del> 710</del>			
-						-			
_						-			
-						<u> </u>			
15—									
						- 705			
_	17.5-37.5': Silty sand CKD, grayish brown, with si	ubrounded pebbles. gravel/sand/fine=10/60/30	0% ::::::			-			
-						-			
20 —						-			
_						<del>- 700</del>			
-									
25—	24-25.5': Includes broken angular mudstone pebt	oles.				-			
-						<del></del> 695			
-						-			
-									
_									
30 —						- 690			
-						-			



35

Barr Engineering Co. 4700 West 77th Street Minneapolis, MN 55435 Telephone: 1-800-632-2277 Fax: 952-832-2601 Remarks Geology data is from Boring B2022; wells W2122 and W2222 are located in an adjacent borehole; wells W2322 and W2422 are located in an adjacent borehole

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

(continued)

Client _C	CMS Land Company	Drill Contractor Prosonic WE	LL CC	ONSTRUCTIO	ON B2022/W2522 V	<b>V2622</b>
Project N	lame Little Traverse Bay CKD Release Site	Drill Method Rotasonic		_	SHELI	2010
Number	22/24-001	Drilling Started 1/17/06 Ended 2/2/	06	Original B	orehole Elevation 720.8	ft
	Petoskey, MI	Logged By SKF, HAW		_		п
Location	r closicy, ivii	Logged by Ott , HAW		Total Dept	th <u>267.5 ft</u>	
_			-og			n,
Depth, Feet	DESCR	RIPTION	hic	9 9	WELL CONSTRUCTION	Elevation, Feet
۵۳			Graphic Log	W2522 W2622	CONSTRUCTION	Ele
	17.5-37.5': Silty sand CKD, grayish brown, with s	ubrounded pebbles.	AGG			
+	gravel/sand/fine=10/60/30%(continued)					<del></del> 685
-						_
-	37.5-47.5': Silty sand CKD, grayish brown, with s	ubrounded pebbles. gravel/sand/fine=5/65/35%				_
-						-
40 —	40-46': Has light gray (10YR5/2 to 10YR5/1) fleck	ks throughout.				_
-						<del></del> 680
+						-
-						-
+						_
45—					<ul> <li>Neat cement grout</li> </ul>	_
+						<del></del> 675
-						_
-	47.5-63.5': Silty sand CKD, grayish brown, with s	ubrounded pebbles. gravel/sand/fine=5/65/35%				_
-						_
50 —						
-						<del></del> 670
-						
-						
-						
55 —						005
-						<del></del> 665
1						
1						
-						
60 —						— 660
1						
1						_
1	63.5-64': Organic rich topsoil.					_
65	64-65': Sand, fine to medium grained, well grade	d.				<u> </u>
65	65-66': Silty sand with pebbles and cobbles.					— 655
1	66-67.5': Weathered bedrock, limestone, silt, and	d pebbles.			Hydrated bentonite	-
	67.5-77.5': Limestone bedrock, fossiliferous, fine	grained, massive.	<b>Y</b> //		chips	-
7		,				



70

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69-70': Limestone has brown silty sand.

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See legend of boring logs for explanations of symbols used.

(continued)

Client CMS Land Company		Drill Contractor Prosonic WELL CONSTRUCTION B2022/W2522 W262							
	Day CKD Dalages Cite		_		SHEE	ET 3 OF 8			
Project Name Little Traverse	Bay CND Release Site	Drill Method Rotasonic			_				
Number <u>22/24-001</u>		Drilling Started _1/17/06	Ended _2/2/0	6	_	Original	Borehole Elevation 720	.8 ft	
Location Petoskey, MI		Logged By SKF, HAW			Total Depth _267.5 ft				
					1			1	
Depth, Feet	DESCR	IPTION		Graphic Log	W2522	W2622	WELL CONSTRUCTION	Elevation, Feet	
67.5-77.5': Limestone	e bedrock, fossiliferous, fine	grained, massive.(continued)				ń			
- - - - 75—								650 - - - -	
	Adalamita hadraak, fina arai	nod massive feesiliferave						— 645 -	
	e/dolomite bedrock, fine grai	ned, massive, tossiliterous.					← Hydrated bentonite	-	
-							chips	640 	
85—								- - 635	
87.5-95': Limestone/d staining.	dolomite bedrock, fine grains	ed, massive, fossiliferous, some rec	loxidation					-	
90 —								630 	
-	ightly more grey with trace f							-	
95-107: Limestone be	edrock, massive, fine graine s 2" above 5" of coral at 102							625 	
100-								- - 620	
-								-	
105			continued)					-	



Remarks Geology data is from Boring B2022; wells W2122 and W2222 are located in an adjacent borehole; wells W2322 and W2422 are located in an adjacent borehole

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client (	CMS Land Company	Drill Contractor Prosonic WELL CONSTRUCTION B2022/W2522 W262							
		·			-		SHEE	T 4 OF 8	
	lame Little Traverse Bay CKD Release Site	Drill Method Rotasonic			-				
Number	22/24-001	Drilling Started _1/17/06 End	ded _2/2/0	6	_ (	Original	Borehole Elevation 720	.8 ft	
Location	Petoskey, MI	Logged By SKF, HAW			_ Т	otal De	epth _267.5 ft		
					Τ				
Depth, Feet	DESCR	RIPTION		Graphic Log	W2522	W2622	WELL CONSTRUCTION	Elevation, Feet	
	95-107': Limestone bedrock, massive, fine grains	ed, no visible fossils.							
_	Fine black laminations 2" above 5" of coral at 102			<b>出</b>				<del></del> 615	
-	107-116': Shale (indicated by geophysics, no san							-	
-									
-									
110-									
_								<del></del> 610	
-									
-									
-									
115—							<ul><li>Hydrated bentonite chips</li></ul>		
-	116-130': Limestone bedrock, massive, fine grain	ned, no visible fossils.					cnips	<del></del> 605	
-	-								
_								-	
_								-	
120 —								-	
-								<del></del> 600	
-									
-				$\mathbb{H}$				-	
-								-	
125—									
-								<del> 595</del>	
_								-	
-								-	
-								_	
130 —	130-197.5': Limestone, fossiliferous-including bra	achionods crinoids and coral structure	s samnle	$\blacksquare$					
-	is broken up.	aomopodo, ormordo, and obrar otrablaro	o, campio	H				<del> 590</del>	
-				Ħ					
4				H				-	
-								-	
135—								-	
4								<del></del> 585	
-								-	
-								-	
-								-	
140 —		/222	tinued)					+	



Remarks Geology data is from Boring B2022; wells W2122 and W2222 are located in an adjacent borehole; wells W2322 and W2422 are located in an adjacent borehole

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client (	CMS Land Company	Drill Contractor Prosonic WELL CONSTRUCTION B2022/W2522 W2							
_	Name Little Traverse Bay CKD Release Site	Drill Method Rotasonic			-		SHEET	Γ 5 OF 8	
	22/24-001	Drilling Started _1/17/06	Ended 2/2/0	06			ID I I I I I 700 (	. "	
	Petoskey, MI	Logged By SKF, HAW		-	Original Borehole Elevation 720.8 ft				
Location	- otodioy, im	Logged Dy _Crtt ; Firth			.	l otal D	epth _267.5 ft	1	
Depth, Feet	DESCR	IPTION		Graphic Log	W2522	W2622	WELL CONSTRUCTION	Elevation, Feet	
	130-197.5': Limestone, fossiliferous-including bra	achiopods, crinoids, and coral str	ructures, sample	$\Box$		Ń		<b>—</b> 580	
_	is broken up. (continued) 2" Dark gray aphanitic shale lens at 140'.			日				_ 380	
								_	
				Н				_	
145—				H				_	
-				Ħ				<del></del> 575	
-				Ħ					
_				$\mathbf{H}$				_	
-				出				_	
150 —				井			<ul><li>Hydrated bentonite chips</li></ul>		
-				井			Спрэ	<del> 570</del>	
-				开					
_									
455				Ш					
155—				H				— 565	
_				Ħ				_	
_				$\mathbf{H}$					
_				$\Box$				_	
160 —				H				_	
_				井				<del> 560</del>	
-				H					
-									
-				Н					
165—				Ħ				_ 555	
-				H				_ 555	
				Ħ					
								_	
170 —								_	
-								<del> 550</del>	
-				H				-	
-				田				_	
-				田				-	
175—			(continued)					-	



Remarks Geology data is from Boring B2022; wells W2122 and W2222 are located in an adjacent borehole; wells W2322 and W2422 are located in an adjacent borehole

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client C	MS Land Company	Drill Contractor Prosonic WE	ONST	NSTRUCTION B2022/W2522 W2622					
	ame Little Traverse Bay CKD Release Site	Drill Method Rotasonic				SHEE	T 6 OF 8		
	22/24-001	Drilling Started 1/17/06 Ended 2/2/0	)6		- Original Borehole Elevation 720.8 ft				
Location	Petoskey, MI	Logged By SKF, HAW			Total Depth _267.5 ft				
			, ,		TOLALD	ерш _207.5 п			
Depth, Feet	DESCR	IPTION	Graphic Log	W2522	W2622	WELL CONSTRUCTION	Elevation, Feet		
	130-197.5': Limestone, fossiliferous-including brais broken up. (continued)	achiopods, crinoids, and coral structures, sample	$\Box$				<del> 545</del>		
-							-		
180 —							- 540 - -		
- 185 — - -						Hydrated bentonite chips	- - 535 -		
- 190 — -							- - - - 530		
- 195 — -							- - - 525		
200—	197.5-232': Limestone, fossiliferous, 5-10% fossi	ls.					-		
-							520 - - -		
205 —							- 515 -		
210		(continued)					-		
		(CONTINUEA)	1 1	1			1		



Remarks Geology data is from Boring B2022; wells W2122 and W2222 are located in an adjacent borehole; wells W2322 and W2422 are located in an adjacent borehole

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client (	CMS Land Company	Drill Contractor Prosonic	WE	LL C	ONS	TF	RUCT	ΓΙΟΝ B2022/W2522 V	
	lame Little Traverse Bay CKD Release Site	Drill Method Rotasonic						SHEET	7 OF 8
	22/24-001		ed <u>2/2/</u> 0	06	_	C	)rigina	l Borehole Elevation 720.8	ft
Location	Petoskey, MI	Logged By SKF, HAW							
Location	1 etoskey, ivii	Logged By SKI, HAVV			_	T	otal D	epth 267.5 ft	
Depth, Feet	DESCR	IPTION		Graphic Log		W2522	W2622	WELL CONSTRUCTION	Elevation, Feet
	197.5-232': Limestone, fossiliferous, 5-10% fossi	ls.(continued)					Ė		
215 —  220 —  225 —  -  -  -  -  -  -  -  -  -  -  -  -  -	219-220': Limestone is darker gray, fine grained,							→ Hydrated bentonite chips	- 510 505 
4	227.8-229': Weathered limestone horizontal bedo	ling.		丗		ı			_
- 230 — -	229-232': Limestone is vuggy.								- - 490
- - 235—	232-237.5': Brown limestone, fossiliferous-fossils	are light gray.						Filter sand  5' long, 2" diameter, 10	- - - - 485
- - 240 —	237.5-247.5': Limestone, fossiliferous-fossils are	light gray, 5% fossils.						slot, type 304 stainless steel screen	- - - - - 480
- - - 245	243': 3" of laminated, moderate field strength, not bedding.	fully cemented mudstone, with horizont						<ul><li>Hydrated bentonite chips</li></ul>	-



Remarks Geology data is from Boring B2022; wells W2122 and W2222 are located in an adjacent borehole; wells W2322 and W2422 are located in an adjacent borehole

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client _0	CMS Land Company	Drill Contractor Prosonic	WELL CONSTRUCTION B2022/W2522 W2622 SHEET 8 OF 8								
Project N	lame Little Traverse Bay CKD Release Site	Drill Method Rotasonic			10010						
Number	22/24-001	Drilling Started _1/17/06 Ended _2/2/0	06	— Original Borehole Elevation _720.	8 ft						
Location	Petoskey, MI	Logged By SKF, HAW		Total Depth 267.5 ft							
Depth, Feet	DESCR	IPTION	Graphic Log	WELL CONSTRUCTION	Elevation, Feet						
	237.5-247.5': Limestone, fossiliferous-fossils are	light gray, 5% fossils.(continued)			<b>—</b> 475						
_					-						
- - 250 <i>-</i>	247.5-257.5': Calcareous mudstone.			<ul><li>Hydrated bentonite chips</li></ul>	-						
					470 						
- 255 <i>-</i>				Filter sand	- - 465						
260—	257.5-264': Limestone, massive, microcrystalline fractures, moderate HCl reaction.	, secondary calcite mineralization in sub vertical		5' long, 2" diameter, 1' slot, type 304 stainles: steel screen	- 0- 5_ 460						
- -	264-267.5': Limestone, vuggy with calcite replace	ment in voids, strong reaction to HCI.		Borehole diameter decreased to 4.8" at 262 feet	- - -						
265— - -	END OF BORING-267.5' bgs			Cave-in material	— 455 - -						
270—	2.10 0. 201.10 201.0 200				-						
- - -					450  -						
275— - -					- 445 -						
280—					-						

BARR

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Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client _	CMS Land Company	Drill Co	Contractor Prosonic	CONSTRUCTION	N B2025/W2125 W2225 W2325 W	V2425
Project N	Name Little Traverse Bay CKD Release Site		Method Rotasonic		— SHEET	1 OF 6
Number	22/24-001	Drilling	g Started <u>2/3/06</u>	Ended _2/8/06	— Original Borehole Elevation 691.2	ft
Location	Petoskey, MI	Logge	ed By HAW		Total Depth _208.5 ft	
Depth, Feet	DESCRIPTION	Graphic Log	W2125 W2225	WELL CONSTRUCTION Ground elevation	WELL CONSTRUCTION Ground elevation	Elevation, Feet
- - -	<ul> <li>0-3': Silty sand, fine to coarse grained with some fine to coarse grained gravel and cobbles, trace grass roots.</li> <li>3-9': Silty gravel, fine to coarse grained with some fine to coarse grained sand and trace cobbles.</li> </ul>			691.2 ft Riser elevation W2125 691.04 ft, W2225 691.03 ft  Borehole diameter 6";	691.2 ft  — Riser elevation	- 690 
5— - - - 10—	9-40": CKD, silt sized, weakly cemented with trace white flecks of weakly cemented CKD,			2" diameter Sch 40 PVC riser	2" diameter; W2325: Sch 40 PVC riser; W2425: Type 304 stainless steel riser	- 685 - -
- - - -	homogeneous.					680 
15— - - - - 20—	14.5-15': Trace mottling					- 675 - - -
- - - - 25 —				Neat cement grout	Neat cement grout	670    665
30 — - - - - - - 35 —	27.5-31': Some mottling			(continued)		_ _ _ _ 660 _ _



#### Remarks

Wells W2325 and W2425 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client _(	CMS Land Company	Drill Co	ontractor <u>WEL</u>	L CONSTRUCTION	N B2025/V 	<b>W2125 W2225 W2325</b> \text{SHEF}	<b>W2425</b> T 2 OF 6
Project N	lame Little Traverse Bay CKD Release Site	Drill Me	ethod Rotasonic			0.122	. 2 0. 0
Number	22/24-001	Drilling	Started _2/3/06	Ended <u>2/8/06</u>	Orig	inal Borehole Elevation 691.	2 ft
Location	Petoskey, MI	Logged	d By <u>HAW</u>		Tota	al Depth 208.5 ft	
Depth, Feet	DESCRIPTION	Graphic Log	W2125 W2225	WELL CONSTRUCTION	W2325 W2425	WELL CONSTRUCTION	Elevation, Feet
- -	9-40': CKD, silt sized, weakly cemented with trace white flecks of weakly cemented CKD, homogeneous. (continued)						- 655 -
40 <i>-</i>	38.5': Well cemented  40-45': Silty sand, fine to medium grained with traces of sluff CKD from above, slight earthy odor, trace of fibrous roots. Grades to more sand than			- Neat cement grout		Neat cement grout	- - - 650
- - 45—	silt.						-
-	45-47': Limestone, fine grained, massive, slight orangish/brown oxidation on some fracture surfaces.						645
_	47-48.5': Shale, very fine grained, fissile, brachiopods and some crinoid stems present.						-
50 — - -	48.5-57": Limestone, dolomitic, fine to medium grained, bedded, fossiliferous, vuggy, calcite present in old fractures.		Ш				- - 640 -
- 55 — -				<ul> <li>Hydrated bentonite chips</li> </ul>			- - 635
- 60 — -	57-72': Limestone, very fine grained, massive, dark weathering rind present on some fracture surfaces		Ш			Hydrated bentonite chips	- - - -630
- 65 <i>-</i> -				− Filter sand			- - - - 625
70	68': Thin black laminations.			– 10' long, 2" diameter, 10 slot, Sch 40 PVC screen			-
70-			Domarka	(continued)			

Wells W2325 and W2425 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client _(	CMS Land Company	Drill Co	ntractor Proso	ELL CONSTRUCTION	N B2025/W	2125 W2225 W2325	<b>W2425</b> ET 3 OF 6
Project N	lame Little Traverse Bay CKD Release Site	Drill Me	thod Rotasoni	С		SHEE	13060
Number	22/24-001	Drilling :	Started _2/3/06	Ended _2/8/06	— Origin	al Borehole Elevation 691	.2 ft
Location	Petoskey, MI	Logged	By HAW		Total	Depth 208.5 ft	
Depth, Feet	DESCRIPTION	Graphic Log	W2125 W2225	WELL CONSTRUCTION	W2325 W2425	WELL CONSTRUCTION	Elevation, Feet
75—	57-72': Limestone, very fine grained, massive, dark weathering rind present on some fracture surfaces. (continued)  72-83': Shale, very fine grained, trace fossils, calcite present in fossils.  83-98.5': Limestone, somewhat dolomitic, fine to medium grained, massive, brachiopods and coral present, vuggy, calcite present in old fractures.  Thin 1/4" bedding near 97'.  98.5-99': Shale, very fine grained. 99-125': Limestone, fine to medium grained, massive, coral and brachiopods present, vuggy.			Filter sand ✓ Hydrated bentonite chips		→ Hydrated bentonite chips	
105 <i>-</i>		耳					-
			Remarks	(continued)			
11	Barr Engineering Co.		Nemains				)

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Minneapolis, Minnesota 55435
Telephone: 1-800-632-2277
Fax: 952-832-2601

Wells W2325 and W2425 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client _(	CMS Land Company	Drill Co	Intractor Prosonic SHEET 4 OI	125 0F 6
Project N	lame Little Traverse Bay CKD Release Site	Drill Me	ethod Rotasonic Chief 4 Ch	,, 0
Number	22/24-001	Drilling :	Started 2/3/06 Ended 2/8/06 Original Borehole Elevation 691.2 ft	
Location	Petoskey, MI	Logged	By HAW Total Depth 208.5 ft	_
Depth, Feet	DESCRIPTION	Graphic Log		Elevation, Feet
- 110 — - - - - 115 — -	99-125': Limestone, fine to medium grained, massive, coral and brachiopods present, vuggy.(continued)  Some 1/4" thick beds in between thin black laminations.		Filter sand  5' long, 2" diameter, 10 slot, Sch 40 PVC screen  Borehole diameter decreased to 4.8" at 111 feet  Hydrated bentonite chips	585 580
- 120 — - - -	Dark weathering rind present on some fracture surfaces.		- 57 - 57 57	570
125 — - - - -	125-138.5': Limestone, microcrystalline, massive to somewhat platy, coral present, traces of black brown/black laminations, darker weathering rind present on some fracture surfaces, black laminations evident in some rock fragments.		- 5€ - 5€ - Filter sand	665
130 — - - - 135 —			Suleen -	660 655
140—	138.5-144.5': Limestone, microcrystalline, massive, traces of calcite present in old fracture surfaces, some conchoidal fracture surfaces.		Borehole diameter decreased to 4.8" at 137 feet  Hydrated bentonite chips  (continued)	

Wells W2325 and W2425 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client _C	CMS Land Company	Drill Con	tractor	Pros	ELL CONSTRUCTION	N B202 —	5/W2	125 W2225 W2325 \ SHEE	<b>N2425</b> T 5 OF 6
Project N	lame Little Traverse Bay CKD Release Site	Drill Metl	nod _F	Rotason	ic			OFILE	1 3 01 0
Number	_22/24-001	Drilling S	started	2/3/0	6 Ended _2/8/06	(	Original	Borehole Elevation 691.	2 ft
Location	Petoskey, MI	Logged E	By <u>H</u>	\W		1	Total De	epth _208.5 ft	
Depth, Feet	DESCRIPTION	Graphic Log	W2125	W2225	WELL CONSTRUCTION	W2325	W2425	WELL CONSTRUCTION	Elevation, Feet
- - -	138.5-144.5': Limestone, microcrystalline, massive, traces of calcite present in old fracture surfaces, some conchoidal fracture surfaces.(continued)								- 550 - -
145 — - -	144.5-148.5': Limestone, microcrystalline, bedded, brachiopods present, mother of pear present on shell surfaces.								- 545 - -
150 — -	148.5-168.5': Limestone, microcrystalline, massive, brachiopods and coral present, a few crinoid stems, mother of pearl on some shell surfaces, some conchoidal fracture surfaces, dark weathering rinds present on some fracture surfaces, calcite present in old fractures.								- - 540
- 155 — - -									- - - - 535
160 — - - - -									- - - 530 -
- 165 — - -								Hydrated bentonite chips	- - 525 -
170— - - - -	168.5-178.5': Limestone, microcrystalline, bedded, brachiopods and coral present, calcite present in fossils and old fractures.								- - - 520 -
- 175					(continued)				-

BARR

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#### Remarks

Wells W2325 and W2425 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client _C	CMS Land Company	Drill Co	ntra	ctor	Pro	Sonic Sonic	N B20	25	/ <b>VV</b> 2	125 W2225 W2325 V SHEET	6 OF 6
Project N	lame Little Traverse Bay CKD Release Site	Drill Me	thoc	I _R	otaso	onic				OHEET	0 01 0
Number	22/24-001	Drilling	Star	ted	2/3/	06 Ended <u>2/8/06</u>		0	riginal	Borehole Elevation 691.2	ft
Location	Petoskey, MI	Logged	Ву	НА	W			To	otal De	epth _208.5 ft	
Depth, Feet	DESCRIPTION	Graphic Log		W2125	W2225	WELL CONSTRUCTION	W2325	)	W2425	WELL CONSTRUCTION	Elevation, Feet
				W	W2		W	:			Ш
_	168.5-178.5': Limestone, microcrystalline, bedded, brachiopods and coral present, calcite present in fossils and old fractures. (continued)										- 515 -
- 180 <i>-</i>	178.5-198.5': Dolomitic limestone, fine grained grading to microcrystalline, massive to thinly bedded, vuggy with brachiopods, mother of pearl present on shell surfaces, dark weathering rind present on some fracture surfaces.										- - - 510
- - -	Possible 2 to 5" thick beds.									<ul> <li>Hydrated bentonite chips</li> </ul>	- -
185 — - - -	Becoming thinly bedded near 187'.										- 505 - -
190 <i>—</i> - -	Trace coral and crinoid stems.										- - 500 -
- 195 <i>-</i> -										Filter sand	- - - 495
- - 200 <i>-</i> -	198.5-208.5': Limestone, microcrystalline, massive, trace brachiopods and crinoid stems, dark brown weathering rind present on some									— 5' long, 2" diameter, 10 slot, type 304 stainless steel screen	
- - -	fracture surfaces.										490  
205— - -										←— Cave-in material	- - 485 -
- - 210 <i>-</i>	END OF BORING- 208.5' bgs							26		Sa. S III MASHAI	- -
210			$\perp$	_							
			1/	Re	mark	S					)

Wells W2325 and W2425 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client _(	CMS Land Company	Drill Co	ontractor	Pros	VELL CONSTRUCTION	N B20	)44/	W214	44 W2244 W2344 \	<b>V2444</b>
Project N	lame Little Traverse Bay CKD Release Site		ethod R						SHEE	Г 1 OF 4
Number	22/24-001	Drilling	Started	10/2	23/05 Ended 10/24/05		Oriç	ginal B	orehole Elevation _671.3	3 ft
Location	Petoskey, MI	Logged	d By _JM	A2			Tot	al Dep	th _117.0 ft	
Depth, Feet	DESCRIPTION	Graphic Log	W2344	W2444	WELL CONSTRUCTION  — Ground elevation	77707	W2144	W2244	WELL CONSTRUCTION  — Ground elevation	Elevation, Feet
- - - 5 — - -	0-9.5': Sand, medium grained, well rounded.				671.3 ft  Riser elevation W2344 670.91 ft, W2444 670.89 ft  Neat cement grout  Borehole diameter 7"; 2" diameter Sch 40 PVC riser				671.3 ft  Riser elevation W2144 670.89 ft, W2244 670.91 ft  Neat cement grout  Borehole diameter 7"; 2" diameter Sch 40 PVC riser	- - 670 - - - - - 665 -
10— - -	9.5-11': Sand with gravel and some silt.  11-20': Limestone, fine-grain to microcrystalline, thinly bedded, conchoidal fracture.				Hydrated bentonite chips			⋖	Hydrated bentonite chips	_ _ 660 _
- 15— - - - 20— -	20-26': Dolomitic limestone, fine grained, medium bedded fossiliferous with crinoids shells, and othe fragments. Some black laminations, some core sections display vertical fractures.				Filter sand				— Filter sand  — 10' long, 2" diameter, 10 slot, Sch 40 PVC screen	- - 655 - - - - - 650
25— 30—	26-28': Limestone, fine grained to microcrystalline massive conchoidal fracture.  28-33': Silty limestone, fine grained, thinly to medium bedded, with black laminations, vugs present.  33-53': Limestone, fine grained conchoidal fracture, massive, some black laminations.	33,			Hydrated bentonite chips			▼	— Hydrated bentonite chips	- - 645 - - - - - 640 -
35—					(continued)					
			Re	mark					<u> </u>	=

Wells W2144 and W2244 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Drill Contractor Prosonic Pros Client CMS Land Company SHEET 2 OF 4 Project Name Little Traverse Bay CKD Release Site Drill Method Rotasonic Number 22/24-001 Drilling Started 10/23/05 Ended 10/24/05 Original Borehole Elevation 671.3 ft Logged By JMA2 Location Petoskey, MI Total Depth 117.0 ft Graphic Log Elevation, Feet Depth, Feet WELL WELL **DESCRIPTION** W2144 CONSTRUCTION CONSTRUCTION 33-53': Limestone, fine grained conchoidal fracture, massive, some black laminations. (continued) 635 Hydrated bentonite Hydrated bentonite chips chips 40 Filter sand 630 5' long, 2" diameter, 10 slot, Sch 40 PVC screen 45 Filter sand 625 Borehole diameter Borehole diameter decreased to 6" at 47 decreased to 6" at 47 feet feet 50 620 53-61': Shale, laminated (shaley partings), strong reaction to acid. 55 615 Hydrated bentonite Hydrated bentonite chips chips 60 61-100': Limestone, fine to medium grained, thinly 610 bedded to massive fossiliferous in layers. Layered limestone, colors and fossil content vary. Layers of coral and layers with abundant brachiopods or crinoids and layers with few to no fossils. 65 605 Filter sand Filter sand 70 (continued) Remarks

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Wells W2144 and W2244 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client _(	CMS Land Company	Drill Co	ontra	ctor _	Pros	<b>VELI</b> sonic	L CONSTRUCTION	1 B	2044/W2	144 W2244 W2344 \ SHEE	<b>N2444</b> T3 OF 4
Project N	Name Little Traverse Bay CKD Release Site	Drill Me	ethod	d Ro	tasc	onic		_		SHEE	13014
Number	22/24-001	Drilling	Star	ted _	10/2	23/05	Ended _10/24/05		Original	Borehole Elevation 671.	3 ft
Location	Petoskey, MI	Logged	d Ву	JMA	2			_	Total De	epth 117.0 ft	
Depth, Feet	DESCRIPTION	Graphic Log		W2344	W2444		WELL CONSTRUCTION		W2144 W2244	WELL CONSTRUCTION	Elevation, Feet
75—	61-100': Limestone, fine to medium grained, thinly bedded to massive fossiliferous in layers.(continued)  Some black staining on some fracture surfaces.			-			-Filter sand  -5' long, 2" diameter, 10 slot, Sch 40 PVC screen  Borehole diameter decreased to 4.8" at 74 feet			<ul> <li>Filter sand</li> <li>■ Borehole diameter decreased to 4.8" at 74 feet</li> </ul>	- - 600 - - - - 595 - -
85— 						◀	- Hydrated bentonite chips			<ul> <li>Hydrated bentonite chips</li> </ul>	590 - - - - 585 - -
95—	A few shale fragments in sample.  100-107': Limestone, fine grained, medium bedded to massive, conchoidal fracture on a few surfaces.										- 580 - - - - 575 - - - - 570
- 105 <i>-</i>											
105			$\perp$				(continued)				
	Barr Engineering Co.			Rem	ark	(S					)

4700 West 77th St.

Minneapolis, Minnesota 55435 Telephone: 1-800-632-2277 Fax: 952-832-2601

Wells W2144 and W2244 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

Client _C	CMS Land Company	Drill Co	ntractor Prosoni	L CONSTRUCTION	B2044/W21	44 W2244 W2344 '	<b>W2444</b> T 4 OF 4
Project N	lame Little Traverse Bay CKD Release Site	Drill Me	thod Rotasonic		_	SHEE	14014
Number	22/24-001	Drilling	Started _10/23/05	5 Ended 10/24/05	<ul><li>Original E</li></ul>	Sorehole Elevation 671.	3 ft
Location	Petoskey, MI	Logged	By JMA2		Total Dep	oth _117.0 ft	
Depth, Feet	DESCRIPTION	Graphic Log	W2344 W2444	WELL CONSTRUCTION	W2144 W2244	WELL CONSTRUCTION	Elevation, Feet
	100-107': Limestone, fine grained, medium bedded to massive, conchoidal fracture on a few surfaces.(continued)		4	Hydrated bentonite chips	<	Hydrated bentonite chips	- 565
- 110 — - - -	107-117': Limestone, fine to medium grained, thinly to medium grained, fossiliferous, with brachiopods, crinoid stems, some coral and other fragments. Some calcite replacement of fossils.			Filter sand  5' long, 2" diameter, 10 slot, Sch 40 PVC screen		— Filter sand	- - - - 560 -
115— - - -	END OF BORING - 117 feet bgs.						- 555 -
120— - - -							- - 550 -
- 125— - - -							- - 545 -
130 — - - -							- 540 -
135 — - - -							- 535 - -
140 —							
			Remarks				$\overline{}$

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Minneapolis, Minnesota 55435 Telephone: 1-800-632-2277 Fax: 952-832-2601

Wells W2144 and W2244 are located in an adjacent borehole.

Cement kiln dust (CKD) was identified and logged based on the S.O.P. for Field Screening CKD samples. CKD textures are reported using ASTM Group symbols.

See legend of boring logs for explanations of symbols used.

## Appendix D

Pumping Test Data



Barr Engineering Company
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Minneapolis, MN • Hibbing, MN • Duluth, MN • Ann Arbor, MI • Jefferson City, MO

### **Technical Memorandum**

To:

Project File

From:

John Greer

Subject:

Test Pumping in Well W2125

Date:

April 18, 2008

Project:

22/24-001DV08

C:

Ellen Richard

On April 8, 2008 test pumping was performed in well W2125 in the Seep 2 Area of the Little Traverse Bay CKD Release Site. The purpose of the test pumping was to obtain data for evaluating the potential for installing a pump-out system in the vicinity of W2125 to collect CKD leachate.

Well W2125 is completed at the top of a shale unit approximately 11 feet thick upon which groundwater/leachate appear to be perched beneath the Seep 2 Area. A Grundfos Redi Flo 2 sampling pump was placed in the well for the testing. Pumping rates were measured by timing how long it took to fill a 5-gallon bucket (the bucket was marked in ½-gallon increments. Discharge water was pumped into a holding tank for later disposal in the site treatment plant.

The testing was conducted in two phases. The first phase consisted of a stepped pumping test in which the pumping rate was systematically varied from 1.75 gpm to 7 gpm. The total pumping time in this test was 76 minutes, after which the water level in the well was allowed to recover. The second phase consisted of pumping from the well at a constant rate of 7 gpm for 61 minutes. The field data for these tests is presented in Table 1. Figure 1 shows the depth to water and pumping rates measured during the stepped pumping test. Figure 2 shows the depth to water measured during the constant rate test.

Test data were used to estimate hydraulic conductivity of the limestone above the shale in the vicinity of well W2125. The estimates were made using two approaches: 1) the manual calculation method described on page 1021 of Driscoll (1986) and 2) the Neuman (1972; 1974) solution for flow to a well in an unconfined aquifer and the Theis (1935) Recovery solution as implemented in the software package AQTESOLV (HydroSOLVE, 2006). Table 2 summarizes the results of these estimates. The AQTESOLV graphical output for the Neuman and Theis-Recovery analyses are attached.

**Technical Memorandum** 

To: Project File From: John Greer

Subject: Test Pumping in Well W2125

Date: April 18, 2008

Page: 2

As shown in Table 1, there was a water column of approximately 14.5 feet in well W2125 at the time of the test. The well log for W2125 shows that the bottom of the well screen is three feet below the top of the shale. This indicates that saturated zone in the limestone at well W2125 was approximately 11.5 feet thick. Available groundwater elevation measurements in well W2125 for the period April 2006 to April 2008 indicate that the groundwater elevation varied over a range of approximately 1.5 feet. At the test rates, the specific capacity of well W2125 is approximately 3.8 gpm/ft. This suggests that in order to obtain draw the water level at well W2125 down to 1.5 feet above the top of the shale (i.e., drawdown of approximately 8.5 to 10 feet) a pumping rate of approximately 30 gpm to 40 gpm may be necessary. If multiple recovery wells are to be installed above the shale in the vicinity of well W2125, these test results could be used to develop estimates of potential well interference for various configurations of recovery wells.

#### References

- Driscoll, F.G., 1986. *Groundwater and Wells*, 2<sup>nd</sup> edition, Johnson Filtration Systems, St. Paul, Minnesota, 1089 pp.
- HydroSOLVE, Inc. (HydroSOLVE), 2006. AQTESOLV for Windows, version 4.50 Professional, developed by Glenn M. Duffield.
- Neuman, S.P., 1972. Theory of flow in unconfined aquifers considering delayed gravity response of the water table. Water Resources Research, vol. 8, no. 4, pp. 1031-1045.
- Neuman, S.P., 1974. Effect of partial penetration on flow in unconfined aquifers considering delayed gravity response, Water Resources Research, vol. 10, no. 2, pp. 303-312.
- Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol. 16, pp. 519-524.

# Well W2125 Test Pumping Field Data LTB CKD Release Site

# Stepped-Pumping Test

60.87 ft 75.37 ft 14.50 ft 2.32 gallons Standing Water Well Volume Well depth

4/7/08 11:06 4/7/08 9:54 Start Pump Stop Pump

Water is dark brown, no odor

Water

Level **E** 

Flow Rate

(mdb)

Date & Time

4/7/08 9:57

4/7/08 10:03 4/7/08 10:08

61.45 61.26

1.75 2.70 3.75 4.80 5.00 5.00

4/7/08 10:15

4/7/08 10:20 4/7/08 10:25

61.11

61.73

61.83 61.89

# **Constant Rate Test**

60.89 ft 75.37 ft 14.48 ft 2.32 gallons Standing Water Well Volume Well depth SWL

4/7/08 13:57 4/7/08 14:58 Start Pump Stop Pump

Water is dark brown, no odor

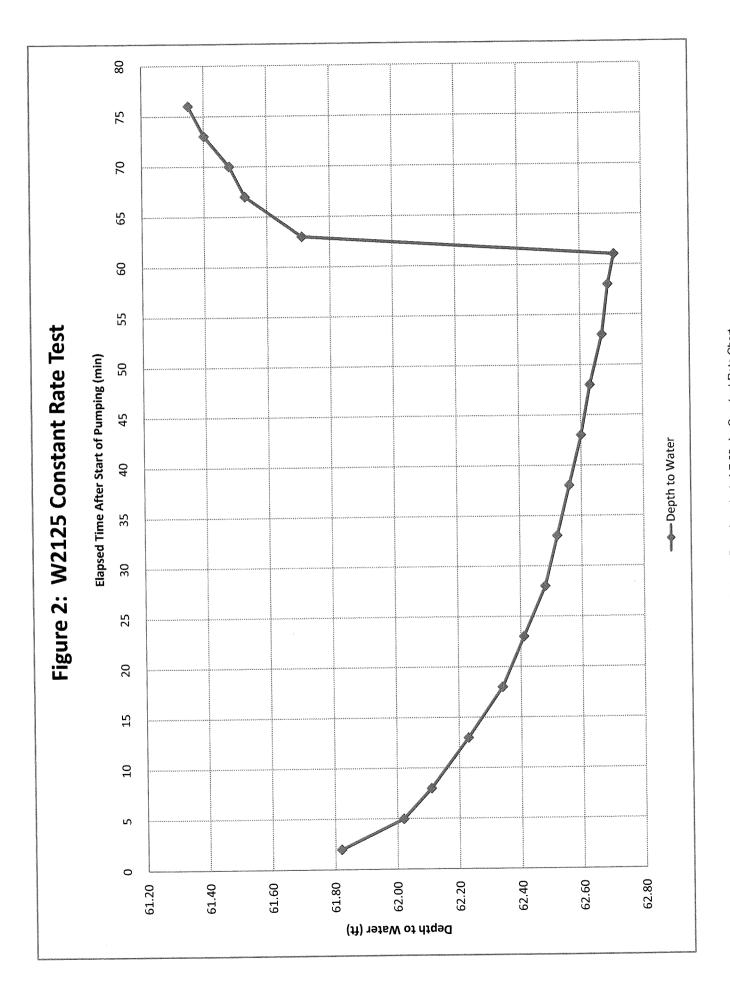
Water	Level	(#)	61.82	62.02	62.11	62.23	62.34	62.41	62.48	62.52	62.56	62.60	62.63	62.67	62.69	62.71		61.71	61.53	61.48	61.40	61.35
	Flow Rate	(mdb)	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	@14:58	00.00	00.00	0.00	0.00	0.00
		Time	4/7/08 13:59	4/7/08 14:02	4/7/08 14:05	4/7/08 14:10	4/7/08 14:15	4/7/08 14:20	4/7/08 14:25	4/7/08 14:30	4/7/08 14:35	4/7/08 14:40	4/7/08 14:45	4/7/08 14:50	4/7/08 14:55	4/7/08 14:58	Stopped pump (	4/7/08 15:00	4/7/08 15:04	4/7/08 15:07	4/7/08 15:10	4/7/08 15:13
					1			1	L			,						·				

					0											
-		·			increased flow to 7.0	gpm @ 10:55					ity, 300 gallons					
61.94	61.98	62.01	62.04	62.06		62.06	62.36	62.42	62.46	62.50	tank capac	61.41	61.36	61.30	61.25	61.22
5.00	5.00	5.00	5.00	5.00		5.00	7.00	7.00	7.00	7.00	011:06 reached	0.00	00.0	00.0	00.0	0.00
4/7/08 10:30	4/7/08 10:35	4/7/08 10:40	4/7/08 10:45	4/7/08 10:50		4/7/08 10:54	4/7/08 10:57	4/7/08 11:00	4/7/08 11:03	4/7/08 11:06	Stopped pump @11:06 reached tank capacity, 300 gallons	4/7/08 11:09	4/7/08 11:11	4/7/08 11:13	4/7/08 11:15	4/7/08 11:17

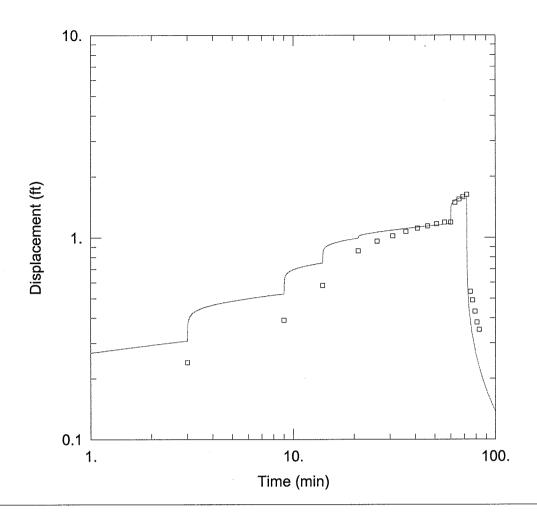
Table 2

## Hydraulic Conductivity Estimates from Well W2125 Pumping Tests

		Estimated Hydraulic Conductivity (ft/d)			
	Estimation	Driscoll	Neuman	Theis (1935)	
	Method	(1986)	(1972; 1974)	Recovery	
Test					
Stepped Pumping		52	52	34	
Constant Rate		53	37	29	
	Geometric Mean of All Estimates (ft/d)	42			



P:\Mpls\22 MI\24\2224001\WorkFiles\Aquifer Test Data\W2125 Test 4-8-08\W2125 Drawdown test\_4-7-08.xls, Constant Rate Chart



#### W2125 STEPPED PUMPING TEST

Data Set: P:\...\W2125\_stepped-pumping\_test.aqt

Date: 04/17/08 Time: 16:08:46

#### PROJECT INFORMATION

Company: <u>Barr</u> Client: CMS

Project: 22/24-001

Location: LTB CKD Release Site

Test Well: <u>W2125</u> Test Date: <u>4/7/2008</u>

#### **AQUIFER DATA**

Saturated Thickness: 14.48 ft

#### **WELL DATA**

Pumpii	ng vveils		Observation wells			
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)	
W2125	0	0	□ W2125	0	0	

#### SOLUTION

Aquifer Model: Unconfined

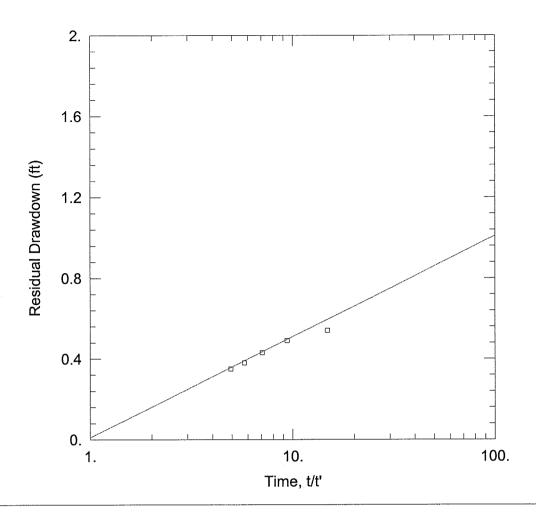
 $T = 752.2 \text{ ft}^2/\text{day}$ 

 $Sy = \overline{0.000}2077$ 

Solution Method: Neuman

S = 0.01

 $\beta = 0.0002981$ 



#### W2125 STEPPED PUMPING TEST RECOVERY

Data Set: P:\...\W2125\_stepped-pumping\_test\_recovery.aqt

Date: 04/17/08 Time: 16:10:07

#### PROJECT INFORMATION

Company: Barr Client: CMS

Project: 22/24-001

Location: LTB CKD Release Site

Test Well: <u>W2125</u> Test Date: <u>4/7/2008</u>

#### **AQUIFER DATA**

Saturated Thickness: 14.48 ft

Anisotropy Ratio (Kz/Kr): 3.355

#### **WELL DATA**

Pui	mping Wells		
Well Name	X (ft)	Y (ft)	W
N2125	0	n	- \

Well Name	X (ft)	Y (ft)
□ W2125	0	0

**Observation Wells** 

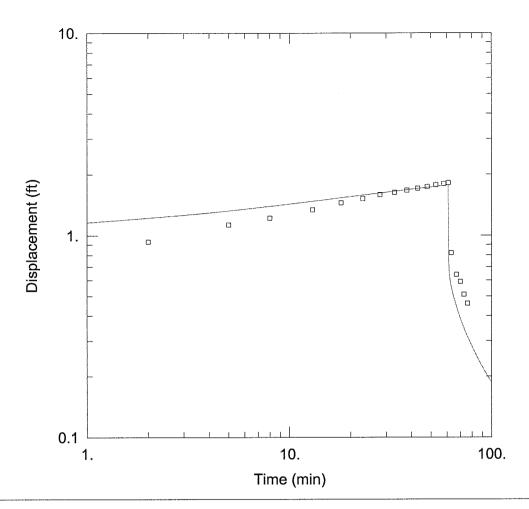
### SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Recovery)

 $T = 493.9 \text{ ft}^2/\text{day}$ 

S/S' = 0.956



#### W2125 CONSTANT RATE TEST

Data Set: P:\...\W2125\_7gpm\_test.aqt

Date: 04/17/08 Time: 15:35:58

#### PROJECT INFORMATION

Company: <u>Barr</u> Client: CMS

Project: 22/24-001

Location: LTB CKD Release Site

Test Well: <u>W2125</u> Test Date: <u>4/7/2008</u>

#### **AQUIFER DATA**

Saturated Thickness: 14.48 ft

#### **WELL DATA**

Pumping Wells						
Well Name	X (ft)	Y (ft)				
W2125	0	0				

Observation Wells						
Well Name	X (ft)	Y (ft)				
□ W2125	0	0				

#### SOLUTION

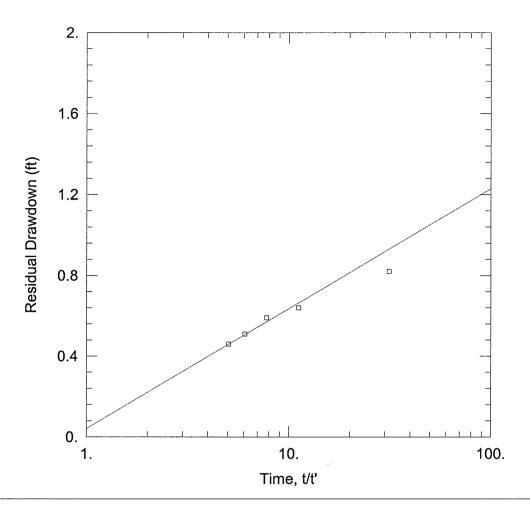
Aquifer Model: Unconfined

Solution Method: Neuman

 $T = 540.1 \text{ ft}^2/\text{day}$ 

S = 0.009347S = 0.001

 $Sy = \overline{0.1}$ 



#### W2125 CONSTANT RATETEST RECOVERY

Data Set: P:\...\W2125\_7gpm\_test\_recovery.aqt

Date: 04/17/08 Time: 15:38:21

#### PROJECT INFORMATION

Company: Barr Client: CMS

Project: 22/24-001

Location: LTB CKD Release Site

Test Well: W2125
Test Date: 4/8/2008

#### **AQUIFER DATA**

Saturated Thickness: 14.48 ft Anisotropy Ratio (Kz/Kr): 1.

#### **WELL DATA**

 Pumping Wells
 Observation Wells

 Well Name
 X (ft)
 Y (ft)
 Well Name
 X (ft)
 Y (ft)

 W2125
 0
 0
 W2125
 0
 0

### SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Recovery)

 $T = 415.7 \text{ ft}^2/\text{day}$ 

S/S' = 0.8541

# Appendix E

Pump Information

# Redi-Flo3™ and CU 300

Environmental Pumps 60Hz



# **Table of Contents**

Features and Benefits
Applications
Communications
Performance and Technical Data
<b>Accessories</b>

## **Features and Benefits**

#### Redi-Flo3 Submersible Pumps

Redi-Flo3 pumps are suitable for both continuous and intermittent operation for a variety of environmental applications including:

- Remediation
- · Pollution Recovery
- Leachate Recovery
- Dewatering
- Tank Applications

## Redi-Flo3 pumps offer the following features:

- Dry-Run Protection
- · High Efficiency Pump End and Motor
- High Starting Torque
- Protection Against Up-Thrust
- Soft-Start
- Over- and Under-Voltage Protection
- Overload Protection
- Over-temperature Protection
- Variable Speed
- Electronic Control and Communication

Redi-Flo3 pumps incorporate a totally new motor design. With the use of permanent-magnet technology within the motor, Redi-Flo3 pumps deliver unmatched performance. The combination of permanent-magnet motors and Grundfos' own micro frequency converter, we are now able to communicate with the pump in ways never before possible. Just a few of the features that come out of this combination are constant level control, soft-start and integrated dry-run protection. These are just a few of the many features that Redi-Flo3 pumps can offer.

Redi-Flo3 pumps use the Grundfos "Smart Motor". This permanent-magnet motor is single phase input and with a 2-wire design makes installation easy. The combination of integrated microelectronics in the pump with the optional CU300 status box and R100 at the surface allows communication with the pump through standard electrical motor power leads. No additional wires are required. This feature allows the direct use of multiple sensors, digital input and relays without adding extra control electronics and costs.

The surface CU300 status box allows communication with the "Smart Motor" through the R100 infrared remote control unit or via the CU300 PC Software Tool. This gives you the ability to monitor and setup or change your pumping system to meet the specific needs of your application.

The Redi-Flo3 can operate without the status control box much like a traditional submersible electric pump. Some communication and program functions will not be available in this configuration, but the internal motor protection features are still active.

#### **Pump and Motor Range**

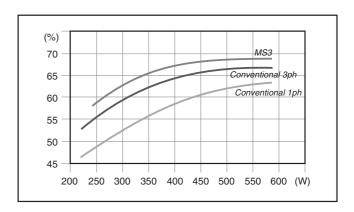
Product	Description
Redi-Flo3 Pump End	10, 22, GPM
MSE3NE Motor	Single Phase 1/2 - 1.5 Hp

#### **Dry-Run Protection**

The Redi-Flo3 incorporates integrated Dry-Run protection. When the fluid level falls below the inlet of the pump, the pump automatically shuts off. After a programmable period of time, the pump automatically starts up again.

#### **High Motor Efficiency**

Redi-Flo3 motors are based on a permanent magnet rotor, which produce high efficiency within a wide load range. The high and flat efficiency curve of the Permanent-Magnet (PM) motor allows for coverage of a wide power range with the same motor as compared to conventional submersible AC motors. For Redi-Flo3 pumps, this means only three motors to cover the horsepower range from 1/2 to 1.5Hp.



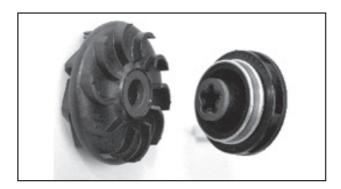
#### **High Pump Efficiency**

The pump end components are made from Polyvinylidene Fluoride (PVDF). The pumps are designed to deliver at peak efficiency levels. Because of high pump efficiencies, overall power consumption will be reduced.

## **Features and Benefits**

#### **Wear Resistance**

Redi-Flo3 pump design uses "floating" impellers. Each impeller has its own tungsten carbide/ceramic bearing. This design and the environmental quality of materials make this pump an excellent choice for environmental application projects.



#### **Protection Against Up-Thrust**

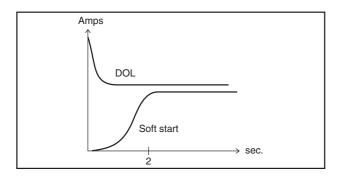
During start-up many pumps start in an up-thrust condition. To prevent damage caused by up-thrust, a top bearing has been placed in the motor to protect both the pump and the motor against up-thrust.

## Soft-Start

Redi-Flo3 have a soft-start feature possible because of the integrated electronics. Soft-start reduces the starting current and gives the pump a smooth and steady acceleration.

## **High Starting Torque**

Because of the permanent-magnet motor, the Redi-Flo3 pumps have excellent starting capabilities. The high locked rotor torque produced by the PM motor provides a starting torque that is 1.5 times greater than conventional submersible pump motors. Even if the voltage is low, the PM motor will still maintain a high starting torque.



#### Overvoltage and Undervoltage Protection

Overvoltage and undervoltage may occur at any time, especially if you have an unstable voltage supply. The integrated protection in the Redi-Flo3 motor protects itself when voltage falls outside of permissible voltage range. The 230V pump motor will cut out if voltage falls below 150V or above 280V. The motor will automatically start when the voltage is within the permissible range. It is not necessary to have additional voltage protection.

#### **Overload Protection**

When the pump load rises above the maximum amp level, the motor will automatically compensate and reduce the speed to maintain its maximum amp level. If the speed drops to 65% of the nominal speed, the motor will shut off

#### **Overtemperature Protection**

Permanent-magnet motors emit very little heat because of their high efficiency. Redi-Flo3 motors are designed with an internal circulation system to effectively cool all the internal components.

As extra protection, the electronic unit also has a builtin temperature sensor. When the temperature rises too high, the motor will automatically shut-off; when the temperature drops the motor will automatically restart.

#### Variable Speed

The Redi-Flo3 "Smart" motor enables continuous variable speed control within 30%-100% (3,000-10,700 rpm). The pump can be set to operate at any duty point in the range between 30% and 100% of the pumps performance curve. The pump can be adapted to any specific requirement. The variable speed control requires the status box and R100 or potentiometer.

### Installation

Redi-Flo3 pumps can be installed vertically or horizontally (Note: the pump must not fall below the horizontal level in relation to the motor). For horizontal installations, a flow sleeve is recommended to ensure sufficient flow past the motor to provide proper cooling and prevent the unit from being buried in sand or silt.

## **Applications**

## Remediation/Pollution Recovery/Dewatering

Connection of a sensor such as a submersible pressure sensor enables the pump via the status control box to maintain a constant level by starting and stopping the pump based on a desired water level.

## **Maintaining a Constant Water Table**

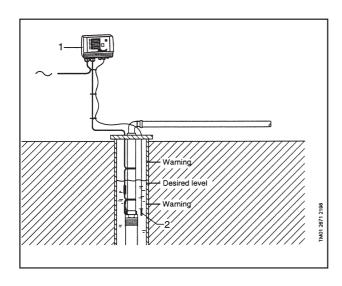
### Introduction

By monitoring the water table and controlling the pump, the water table can be maintained at a constant level.

## **EXAMPLES OF APPLICATION:**

For example maintaining a constant water table is useful in the following situations:

- When the groundwater should be kept out of a building site.
- When the salt water should be kept from penetrating a borehole with potable water.



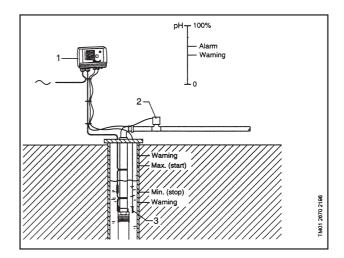
## **Description**

Pos.	Description
1	CU300
2	Level sensor

# Remedial Pumping with Water Quality Monitoring

## Introduction

By means of sensor signals it is possible to carry out remedial pumping where the water contains contamination e.g. chemicals, oils, etc.

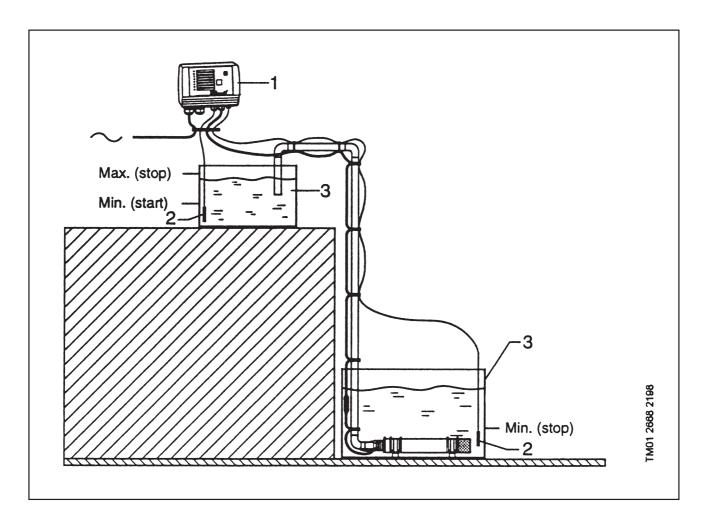


## **Description**

Pos.	Description
1	CU300
2	pH sensor
	Detects the water quality
3	Level sensor

## **Pumping from One Tank to Another**

Where there is a need to move water from one tank to another, the Redi-Flo3 is ideal.



## Description

Pos.	Description
1	CU300
2	Level sensor
3	Water tank

NOTE: When the Redi-Flo3 pump is installed horizontally, it is recommended that a flow sleeve be fitted. The motor must be fully submerged in the water.

## Sensor 1 (tank at top)

Level	Description
Max. (stop)	When the water has reached this level, the pump stops. Green indicator light in on/off-button flashes.
Min. (start)	When the water has dropped to this level, the pump starts. Green indicator light in on/off-button is constantly lit.

## Sensor 2 (bottom tank)

Level	Description
Min. (stop)	When water has dropped to this level, tank is empty, stop pump.

## **Status Control Box Communication**

#### Redi-Flo3 CU300 Status Box

The CU300 status box is a control and communication unit especially developed for the Redi-Flo3 submersible pumps.

The CU300 status box provides:

- · Easy adjustment to a specific well
- Full control of Redi-Flo3 pumps
- Two-way communication with the Redi-Flo3 pumps
- Indicator lights on the front to indicate alarms
- The ability to start and stop the pump with the push of a button.

The CU300 communicates with the pump using the power leads. It is not necessary to run any extra cables between the pump and the CU300 status box.

The following alarms can be indicated by the CU300:

- No Contact
- Overvoltage
- Undervoltage
- Dry-run
- Speed Reduction
- Overtemperature
- Overload
- Sensor Alarm

## The CU300 incorporates:

- External signal input for three sensors
- · relay output for external alarm control
- Control according to the signals received, e.g. flow, pressure, water level and conductivity

The CU300 can communicate with the R100 infrared remote control or R100 PC software tool.

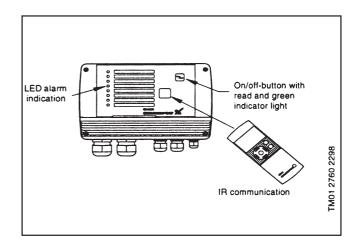
#### **R100 Remote Control or PC Software Tool**

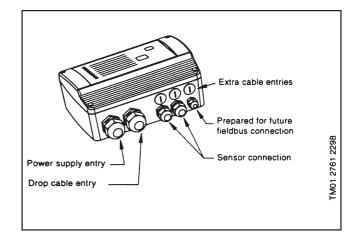
The R100 allows you to monitor the installation by reading current operating parameters, such as:

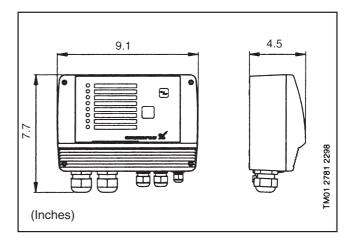
- Power Consumption
- Energy Consumption
- Number of Operating Hours

It allows you to change factory settings. A number of settings can be made, such as:

- Speed (Performance)
- Constant Pressure Control Mode
- De-watering Function
- Automatic Restart Time







## **Multiple CU300 Installation Requirements**

The CU300 Redi-Flo3 control panel communicates with the Redi-Flo3 motors via the pump power cable to turn the pumps on and off, set motor speed and monitor pump status. The technique used for performing this communication impresses a high frequency data signal on the pump power cable that is picked off by internal pump electronics and then decoded into command instructions. This is the reason for assigning unique numbers to each CU300 in a multiple unit installation. The unique number serves as a communication address between each CU panel/motor pair.

In situations where multiple CU300 pump power cables are run parallel in wiring trays or conduit and less than 10-12 inches apart, the possibility for undesired communication between units exists. When this occurs, intermittent or continuous NO CONTACT is typically seen. Other unexpected errors may also be seen.

There are two approaches available to eliminating the possibility of this occurring:

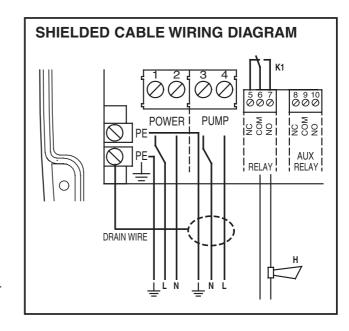
- Physical separation of cables maintain a minimum distance of 10-12 inches between pump power cables, and never place more than one cable in a conduit.
- Use shielded cable The use of shielded cable prevents cross communication between parallel cables and allows sharing of conduit and cable trays. Tie the cable shield to earth only at the CU control panel.

#### Suitable cables:

Manf.	Part #	Gage
Anixter	2A-1403S	14
Anixter	2A-1203S	12
Anixter	2A-1003S	10

Anixter (1-800-321-1486)

In addition, Grundfos recommends applying power to only one CU panel/motor at a time while programming the CU number with the R100. This will prevent the possibility of two pumps receiving the same number assignment command.



## **R100 Menu Structure**



## **R100 Menu Structure**

## R100 Menu Structure for the CU300

(ref. CU300 I&O)

#### 0. General

## 1. Operation

- 1.1 Set-point setting
- 1.2 Selection of operating mode
- 1.3 Alarm indication

#### 2. Status

The indication of:

- 2.1 Actual operating mode
- 2.2 Actual and external set point
- 2.3 Actual motor temperature
- 2.4 Actual motor speed
- 2.5 Actual power input and accumulated motor power consumption.
- 2.6 Accumulated number of operating hours and accumulated number if starts.
- 2.7 Actual values of sensors 1 and 2 respectively
- 2.8 Actual values of the digital input
- 2.9 Accumulated flow, and the power used to pump 1 gal.

R100 allows you to make a number of settings:

## 3. Limits

The setting of:

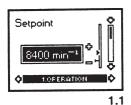
- 3.1 Sensor 1
- 3.2 Min. and max. stop limit of sensor 1
- 3.3 Min. and max. warning limit of sensor 1
- 3.4 Min. and max. alarm limit of sensor 1
- 3.5 Sensor 2
- 3.6 Min. and max. stop limit of sensor 2
- 3.7 Min. and max. warning limit of sensor 2
- 3.8 Min. and max. alarm limit of sensor 2
- 3.9 Filling or emptying
- 3.10 Setting of the function of the digital sensor connected to the digital input
- 3.11 The setting of the water quantity stop limit and the setting of the sensor to detect water quantity
- 3.12 The setting of the temperature warning limits of the motor electronics

## 4. Installation

- 4.1 Selection of controller
- 4.2 Setting of external set-point
- 4.3 Setting of automatic restart time
- 4.4 Allocation of individual start delays
- 4.5 Setting of the stop and run times for the de-watering function
- 4.6 Setting of the value of the Dry-Run shutdown
- 4.7 Activating or deactivating the Dry-Run protection
- 4.8 Setting of the maximum motor speed
- 4.9 Activating or deactivating the on/off-button on the CU 300
- 4.10 Allocation of number where more than one CU300 is installed

## **Examples of R100 displays**

#### **Menu OPERATION**



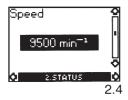
## **Set-point Setting**

From the factory, the pump is set to maximum speed, 10,700 rpm. R100 allows you to reduce the pump speed by changing the setpoint. The speed can be set from 3,000–10,700 rpm, at 100 rpm intervals.

The unit of the set-point is automatically changed according to the unit of the sensor connection to sensor input no. 1 if closed loop.

EXAMPLE: Sensor input no. 1 is connected to a pressure sensor using the unit feet (ft.) and the range 0 -200 (dependent on the actual sensor characteristics). Therefore, the set-point of display 1.1 can be set to between 0-200 ft.

#### Menu STATUS

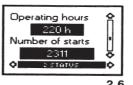


The displays appearing in this menu are status displays only. You cannot change settings in this menu.

## **Example**

In display 2.4, the actual speed of the pump is shown.

## Accumulated Number of Operating Hours and Number of Starts

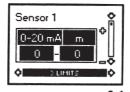


The value of operating hours and the number of starts are values accumulated from the time of installation and they cannot be reset.

Both values are stored in the motor electronics, and are kept even if the CU300 is replaced.

The number of operating hours is measured every two minutes of continuous operation, but the display value is updated every two hours.

#### Menu LIMITS



The Setting of Sensor 1

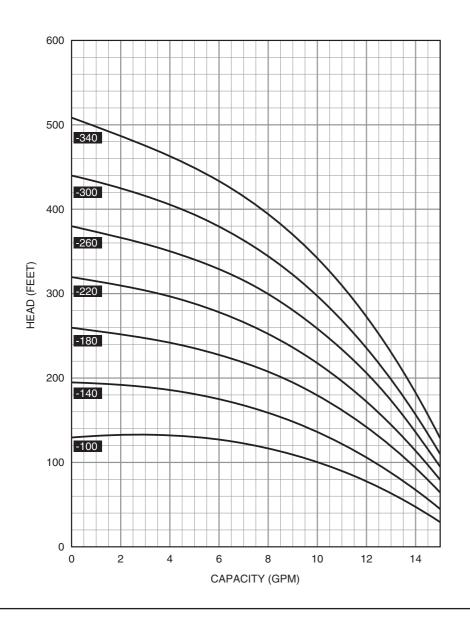
Depending on the type of sensor, the following settings can be made:

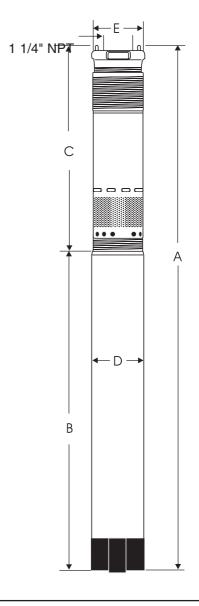
Sensor outputs: (not active), 0-10V, 2-10V, 0-20mA, 4-20mA.

Setting range unit: M3/h, m, %, gpm, ft.

Model #	HP	Size	Disch. Size		Dimensions in Inches			Approx. Ship Wt.	
				Α	В	С	D	E	(pounds)
10Redi-Flo3-100	1/2	3"	1 1/4" NPT	30.4	19.8	10.6	2.6	2.9	12
10Redi-Flo3-140	1/2	3"	1 1/4" NPT	30.4	19.8	10.6	2.6	2.9	12
10Redi-Flo3-180	3/4	3"	1 1/4" NPT	31.5	19.8	11.6	2.6	2.9	13
10Redi-Flo3-220	3/4	3"	1 1/4" NPT	33.6	19.8	13.7	2.6	2.9	13
10Redi-Flo3-260	1	3"	1 1/4" NPT	35.0	21.3	13.7	2.6	2.9	16
10Redi-Flo3-300	1	3"	1 1/4" NPT	36.1	21.3	14.8	2.6	2.9	16
10Redi-Flo3-340	1	3"	1 1/4" NPT	38.2	21.3	16.9	2.6	2.9	16

Note: Weights include pump ends with motors

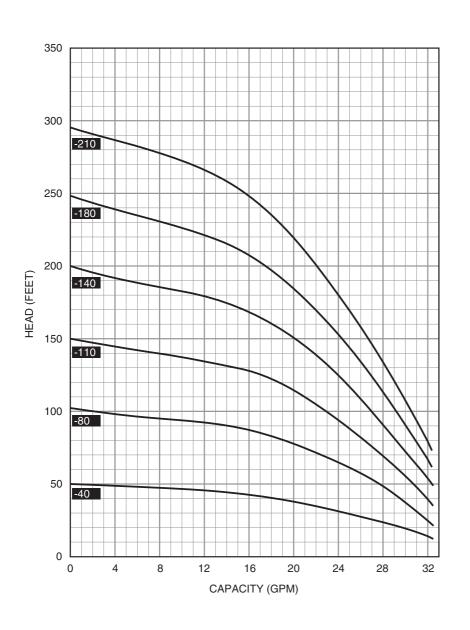


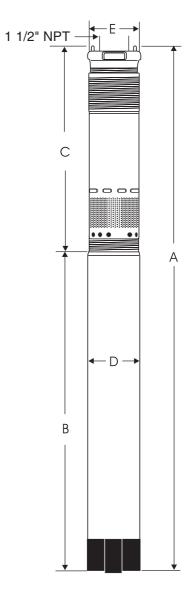


Model #	HP	Size	Disch. Size	Dimensions in Inches			Approx. Ship Wt.		
				Α	В	С	D	E	(pounds)
22Redi-Flo3-40	1/2	3"	1 1/2" NPT	30.4	19.8	10.6	2.6	2.9	12
22Redi-Flo3-80	1/2	3"	1 1/2" NPT	30.4	19.8	10.6	2.6	2.9	12
22Redi-Flo3-110	3/4	3"	1 1/2" NPT	31.5	19.8	11.6	2.6	2.9	13
22Redi-Flo3-140	3/4	3"	1 1/2" NPT	33.6	19.8	13.7	2.6	2.9	13
22Redi-Flo3-180	1	3"	1 1/2" NPT	38.2	21.3	16.9	2.6	2.9	16
22Redi-Flo3-210	1 1/2	3"	1 1/2" NPT	38.2	21.3	16.9	2.6	2.9	16

Note: Weights include pump ends with motors

**Technical Data** 



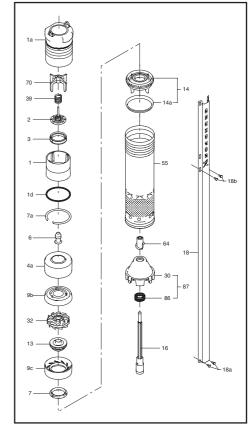


22gpm

# **Redi-Flo3 Technical Specifications**

## MATERIAL SPECIFICATION - REDI-FLO3 PUMP END

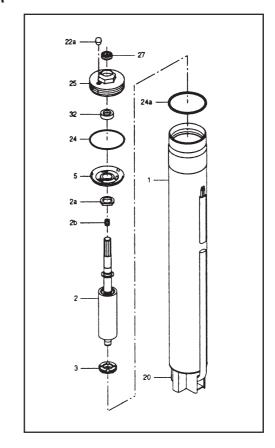
Pos.	Component	Material	DIN W.	AISI
1 03.	Component	Material	Nr.	Aloi
1	Valve Casing	PVDF	IVI.	
1a		Stainless Steel	1.4401	316
	Discharge Chamber		1.4401	316
1d	O-Ring	FPM Rubber		
2	Valve Cone	PVDF		
3	Valve Seat	FPM Rubber		
9b	Top Chamber	PVDF		
4a	Empty Chamber	PVDF		
6	Top Bearing	FPM Rubber		
7	Neck Ring	PVDF		
7a	Lock Ring	Stainless Steel	1.4401	316
32	Guide Vanes	PVDF		
9с	Bottom Chamber	PVDF		
13	Impeller w/ tungsten carbide bearing	PVDF		
14	Suction Interconnector	PVDF		
14a	Ring	Stainless Steel	1.4401	316
16	Shaft w/	Stainless Steel	1.4401	316
	coupling	Sintered Steel		
18	Cable Guard	Stainless Steel	1.4401	316
18a-b	Cable Guard Screws	Stainless Steel	1.4401	316
30	Pressure Equalization Cone	PVDF		
39	Valve Spring	Stainless Steel	1.4406	316LN
55	Pump Sleeve	Stainless Steel	1.4401	316
70	Valve Guide	PVDF		
64	Priming Screw	PVDF		
86	Lip Seal Ring	FPM Rubber		



# **Redi-Flo3 Technical Specifications**

## MATERIAL SPECIFICATION - REDI-FLO3 PUMP MOTOR

Pos.	Component	Material	DIN W. Nr.	AISI
1	Stator	Stainless Steel	1.4401	316
2	Rotor	Stainless Steel	1.4401	316
2a	Stop Ring	PP		
2b	Filter	Polyester		
3	Thrust Bearing	Carbon		
5	Radial Bearing	Ceramic/ tungsten carbide		
20	Motor Cable	Tefzel		
	w/ plug	PVDF		
22a	Filling Plug	FPM Rubber		
24	O-Ring	FPM Rubber		
24a	O-Ring	FPM Rubber		
25	Top Cover	PPS		
27	Filter	Polyester		
32	Shaft Seal	FPM Rubber		
	Motor Liquid	SML-2		

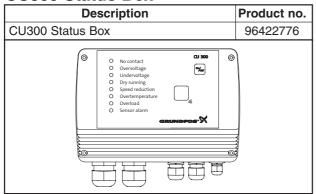


# **Redi-Flo3 Technical Data**

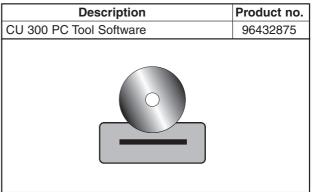
	ELECTRIC
Supply Voltage:	1x200-240V +6%/-10%, 50/60 Hz, PE
oupply rollinger	1x100-115V
Operation via Generator:	As a minimum, the generator output
operation the demonstration	must be equal to the motor P1[KW] +10%
Starting Current:	The motor starting current is equal to the
our my our our	highest value stated on the motor nameplate
Starting:	Soft-start
Run-up Time:	Maximum: 2 seconds
Motor Protection:	The motor is protected against:
	Dry running, overvoltage, undervoltage,
	overload, overtemperature
Power Factor:	PF=1
Service Factor:	0.5[Hp]-1.85 @ 115V/230V
Oct vide i dotor.	0.75[Hp]-2.05 @ 230V
	1.0[Hp]-2.25 @ 230V
Matau Oakla	1.5[Hp]-1.65 @ 230V
Motor Cable:	3 Wire, Tefzel Cable Kit
Motor Liquid:	Type SML 2
pH Values:	2-13
Liquid Temperature:	The temperature of the pumped liquid should not exceed 104°F.
Note: If liquids with a viscosity higher than that of	water are to be pumped,
please contact GRUNDFOS	
Minimum Ambient Temperature:	4° F
Maximum Ambient Temperature:	+140° F
Frost Protection:	If the pump is to be stored after use, it must be stored
	in a frost-free location or it must be ensured that the
	motor liquid is frost-proof. Otherwise motor must be stored without being filled with motor liquid.
ODEDA	
	TING CONDITIONS
Minimum Ambient Fluid Temperature:	32° F
Maximum Ambient Fluid Temperature:	+104° F
APPROXIMATE [	DIMENSIONS AND WEIGHT
Motor Dimensions (MSE - NE 3):	
0.33-0.50A[Hp]	20.9" length x 2.68" diameter
0.50-0.75B[Hp]	20.9" length x 2.68" diameter
1.0-1.5C[Hp]	22.3" length x 2.68" diameter
Pump Diameter, incl. cable guard:	2.91"
Motor Weights (MSE - NE 3):	
0.33-0.50A[Hp]	6.0 lbs
0.50-0.75B[Hp]	7.1 lbs
1.0-1.5C[Hp]	8.2 lb
Pump End Dimensions:	0.00
Pump Diameter:	2.68"
Pump Diameter, incl. cable guard:	2.91"
Pump End Dimensions (min. and max.):	10.6" +0.16.0"
10 Redi-Flo3	10.6" to 16.9" 10.6" to 16.9"
22 Redi-Flo3	10.0 10 10.3
Pump End Weights (min. and max.):	0.0 lb a to 0.5 lb a
All	2.2 lbs to 3.5 lbs
Well Diameter (minimum):	3"
Installation Depth (maximum):	500 feet, below static water level

## **Redi-Flo3 Accessories**

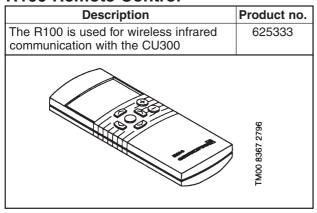
## **CU300 Status Box**



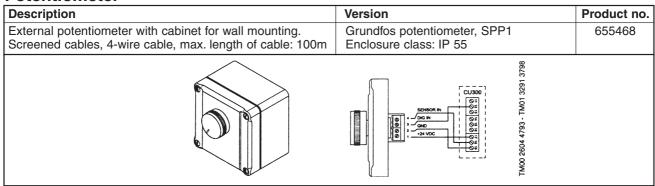
## **CU 300 PC Tool Software**



## **R100 Remote Control**



## **Potentiometer**



## Redi-Flo3 - Flow Sleeve

Description	Product no.	, 25.6" , 3.9",
Flow Sleeve Complete	96037505	
		3.5° E 8.3" 21.6" 2" 80.20 100ML

## Notes

# Notes

## Notes

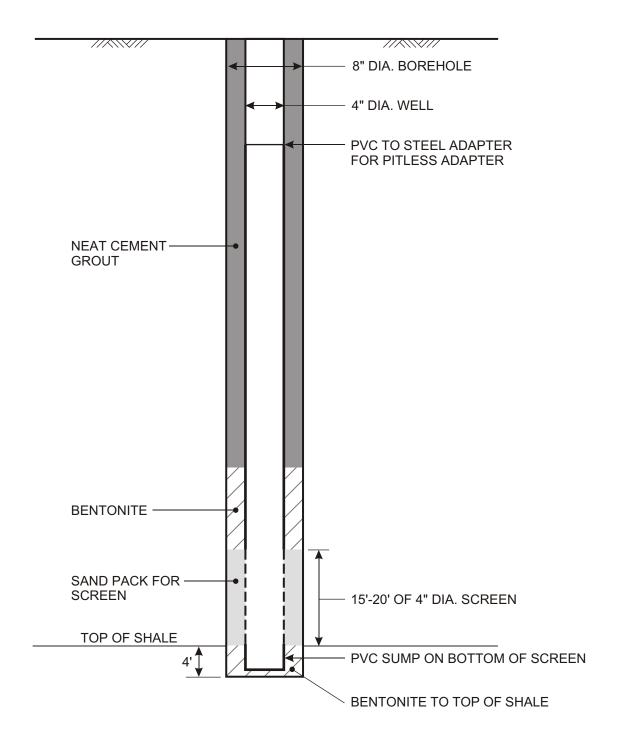
**BE > THINK > INNOVATE >** 

L-RF-TL-014 Rev. 5/06
PRINTED IN USA

Subject to alterations.

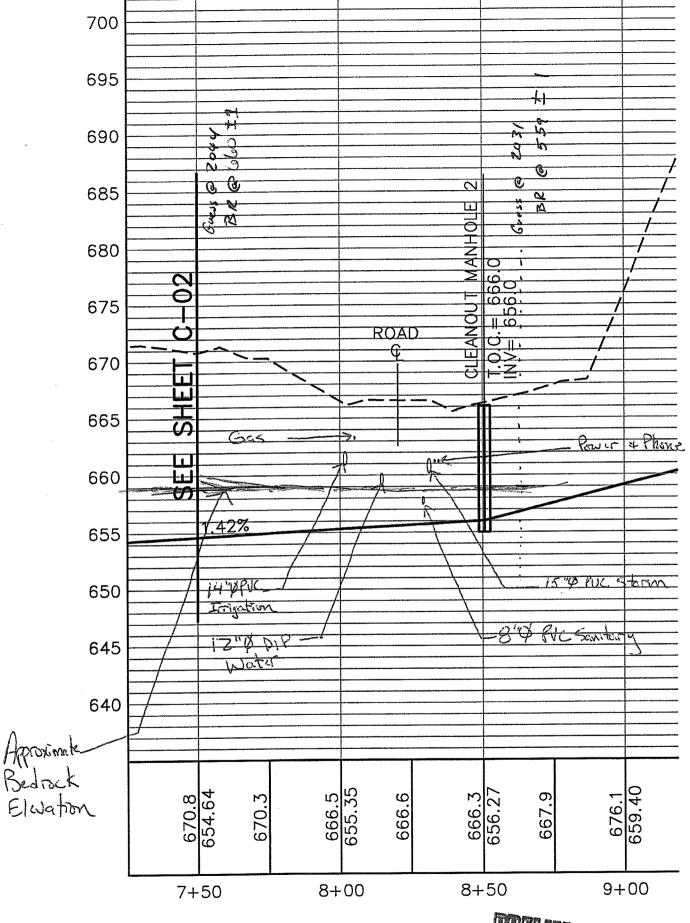
# Appendix F

Well Design



# Appendix G

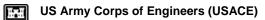
Utility Field Location Results



PRELIMINARY

# Appendix H

MDEQ Joint Permit Application



## Michigan Department of Environmental Quality (MDEQ)

D	E	
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	Previous USACE Permit or File Numb	per			Land and Water Man	agement Division, MI	DEQ File Number	Þ
ш			ס					<u>ର</u>
USE	USACE File Number		ei		Marina Operating Per	rmit Number		<b>₩</b>
ζ.			Rec					임
ΞN(			Date Received		Fee received \$			AGENCY USE
AGENCY					ree received \$			H
	mplete all items in Sections 1 through	nh 0 and those item	es in Sactions 10 through	21 that apply to the	project Clear drawing	as and cross soction	ane must he nre	vidod
	ROJECT LOCATION INFORMATION		is in Sections to through	121 that apply to the p	oroject. Clear drawing	gs and cross section	ilis iliusi be pio	viucu.
	er to your property's legal description		Range and Section inf	ormation and your pro	operty tax bill for you	r Property Tax Ider	itification Numb	er(s)
Addres			, rearrigo, and occion in	Township Name(s)	oporty tax sili for you	Township(s)		Section(s)
5548	B Charlevoix Road			Resort		34N	6W	9
City/Vi		County(ies)		Property Tax Identif				
Peto:	•	Emmet			2-010, -012, a			
Name		Project Name or		Subdivision/Plat	Lot	Number	Private	
	oody Wetland near Little erse Bay of Lake	Job Number Lit	tle Traverse Bay				Claim	
Mich		CRD Release	Sire					
Projec	t types 🔀 private		overnment	industrial		commercial	multi-f	
(check	all that apply) building addition	new buil		building renovation		iver restoration	single	
for k	⊠ other (explain) Removal Action, Little Tra	Augmenti Verse Ray CKI	ation to Interim R	esponse Action p cket No. VW-04	oursuant to the 5-C-810 Febru	Aaministrative Jany 22 2005	e Oraer of ( )	Consent
	oposed project is on, within, or invo			gally established Cou			/ /	
		ess than 5 acres)		reat Lake or <i>Section 1</i>	•		a new marina	
ar			<del></del>	esignated <i>high risk erd</i>			a <i>structure</i> remo	oval
ac	ditch or drain an <i>inland</i>	<i>l lake</i> (5 acres or m		esignated <i>critical dune</i>		wetland 🔀	a utility crossing	I
□ a t	floodway area 🔲 a 100-ye	ar floodplain	☐ a de	esignated <i>environmen</i>	tal area 🔲 50	00 feet of an existin	g waterbody	
	ESCRIBE PROPOSED PROJECT					THODS		
	ch separate sheets, as needed, inc			• .				
	ect includes the installation							
	attached Site Location) d	•						
	within the Seep 2 CKD A		•		_	•		•
	ed under a wetland. The			to reflect exist	ing conditions.	The attached	drawings, d	aerials,
	plans explain the project							
	PPLICANT, AGENT/CONTRACTO				o activity			
	applicant can be either the propert e applicant is a corporation, both th					ntractor to act on th	oir hohalf	
Applica		c corporation and i	is owner must provide a	Agent/Contractor	ionzing the agentreor	initiación to act on ti	icii beriali.	
	dual or corporate name) <i>CMS E</i>	nergy		· ·	tact person) Nort	hern A-1 - E	ddie Ascione	2
Mailing	g Address <i>One Energy Plaza</i>	•		Address 6502 U	5 31 South			
		State <b>MI</b> Zip Coo	le <b>49201</b>	City <i>Bayshore</i>		State MI	Zip Code	e <b>48711</b>
-	ne Phone Number with Area Code	Cell Phone Nun			mber with Area Code		Phone Number	r
<i>517</i> -	768-7389	517-740-82	254	231-258-7300	)	23:	1-499-7050	
Fax 🕹	5 <b>17-788-0136</b> E-mail	drsporer@ci	msenergy.com	Fax -	-	E-mail <i>eddie</i>	a@northern	a1.com
	applicant the sole owner of all prope							
	provide a letter signed by the proper							
	all property owners' names, mailing other encumbrance upon the property					omer easements, o	ieeu restrictions	s, reases,
	ty Owner's Name	orty in the project a	rea. A copy of the failu i	Mailing Address	viucu.			
	erent from applicant) <i>Bay Harbo</i>	or Golf Club. 1	Inc., Bay Harbor	9.123.000				
	L.L.C., and City of Petosk		•					
	erty owners)	, (====================================						
	ne Phone Number with Area Code	Cell Phone No	umber	City		State	Zip Code	
		_	-				-	

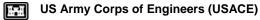


## PROPOSED PROJECT PURPOSE, INTENDED USE, AND ALTERNATIVES CONSIDERED (Attach additional sheets if necessary)

- The purpose must include any new development or expansion of an existing land use.
- Include a description of alternatives considered to avoid or minimize resource impacts. Include factors such as, but not limited to, alternative construction technologies; alternative project layout and design; alternative locations; local land use regulations and infrastructure; and pertinent environmental and resource issues.
- For utility crossings, include both alternative routes and alternative construction methods.

determined to have a greater impact for	•			
to the wetland area. Alternative routes	s were also evaluated and were deter	mined to have the	potential	of greater
environmental impact to the area.				
<ul><li>LOCATING YOUR PROJECT SITE</li><li>Provide the requested information listed below to he</li></ul>	un staff locate your project site			
<ul> <li>Attach a copy of a map, such as a plat, county, or U:</li> </ul>		cation and include an arr	ow indicating t	he north direction
<ul> <li>Project area must be staked at the time of application</li> </ul>		sation and include an an	ow malcating t	ne north direction.
Is there an access road to the project? ☐ No ☒ Yes		vate 🔀 public	impro impro	oved unimproved
Name of roads at closest main intersection <i>Coastal</i>	Woods Court and Highway 31	(a.k.a. Charlevoix	Avenue)	
Directions from main intersection See attached S	Site Location Map for project location	n		
Style of house or other building on site  ranch :	2-story 🔲 cape cod 🔲 bi-level 🔲 cottage/cab	in 🗌 pole barn 🔀 no	ne 🔲 other (d	describe)
Color of adjacent property	house and/or buildings			
House number . Address is visible on	☐ house ☐ garage ☐ mailbox ☐ sign	other (describe)		
Street name Fire lane number	Lot number			
How can your site be identified if there is no visible add	dress?			
Provide directions to the project site, with distances fro	m the best and nearest visible landmark and wate	rbody		
Does project cross boundaries of two or more political	jurisdictions? (City/Township, Township/Township	, County/County, etc.)		
No Yes (If Yes, list jurisdiction names.)			1 1 1	, ,
List all other federal, interstate, state, or local ager				
Agency Type approval	• • • • • • • • • • • • • • • • • • • •	te approved / denied	•	eason for denial
— · · ·	for augmentation of interim remedia			e Oraer of Consent
for Removel Action, Little Traverse Bay	CKD Kelease Site (Docket No. VW-	U5-C-81U, Feb 2	2, 2005)	
The permit is issued data activity will common (A	MDM 4 = : !! 21   2000	Dranged comp	ation data /M/F	200 11-1/22/2009
If a permit is issued, date activity will commence (Notes any construction activity commenced or been				D/Y) May/ 23/ 2008 onducted under a MDEQ
If Yes, identify the portion(s) underway or completed of		permit? No		Silducted diluci a MDEQ
attach project specifications and give completion date(	(s) (M/D/Y) / /	If Yes, list the M		ımber
Are you aware of any unresolved violations of environr	mental law or litigation involving the property? 🔀 I	No 🔲 Yes (If Yes, exp	lain)	
8 PUBLIC NOTIFICATION (Attach additional sheet		liched lake board, includ	ling the contact	t norcon's name
<ul> <li>Complete information for all <i>adjacent and impacted</i></li> <li>If you own the adjacent lot, provide the requested in:</li> </ul>			iing the contact	t person's name.
Property Owner's Name	Mailing Address	City	Sta	te Zip Code
Golf Sites, LLC	<u>J</u>			
(5434 Coastal Woods Ct)	4000 Main Street	Petoskey	MI	49770
Bay Harbor Village Co				
(5505 Coastal Woods Court)	4000 Main Street	Petoskey	MI	49770
City of Petoskey	100 West Lake Street	Petoskey	MI	49770
Name of Established Lake Board or Lake Asso				
and the Contact Person's name, phone number, and m				
·	3			
9 APPLICANT'S CERTIFICATION I am applying for a permit(s) to authorize the activities	READ CAREFULLY BEFORE SIGNING			

accurate, and, to the best of my knowledge, is in compliance with the State Coastal Zone Management Program and the National Flood Insurance Program. I understand that there are penalties for submitting false information and that any permit issued pursuant to this application may be revoked if information on this application is untrue. I certify that I have the authority to undertake the activities proposed in this application. By signing this application, I agree to allow representatives of the MDEQ, USACE, and/or their agents or contractors to enter upon said property in order to inspect the proposed activity site and the completed project. I understand that I must obtain all other necessary local, county, state, or federal permits and that the granting of other permits by local, county, state, or federal agencies does not release me from the requirements of obtaining the permit requested herein before commencing the activity. I understand that the payment of the application fee does not guarantee the issuance of a permit.



## Michigan Department of Environmental Quality (MDEQ)



- All applicants must complete all of the items in Sections 1 through 9 on pages 1 and 2 of this application.
- Complete those items in Sections 10 through 21 that apply to the project. Submit only those pages where you have provided information.
- Your application will not be processed if the application form is not completely filled out.
- List here the application page numbers being submitted and a brief description of other attachments included with your application. Attachements include the following:
- Cover Letter

VW-05-C-810, February

22, 2005)

• Attachment 1 - Site Location, Site Map and Plan and Profile Drawings

• A letter of authorization from the owner must be included if not signed below by the owner.

David R. Sporer

- Attachment 2 EPA AOC and EPA Communication
- Attachment 3 List of Affected Property Owners
- Attachment 4 Drilling Mud Detection and Response Plan
- Submit 8.5" by 11," 8.5" by 14" or 11" by 17" size drawings with 4 copies. The USACE requires one set of drawings on 8.5" x 11" paper, with all notations clearly legible. Larger copies may be submitted in addition to the standard size copies.

Property Owner			
☐ Agent/Contractor			
Corporation – Title <i>CMS</i>			
(authorization via			
Administrative Order of		David R Some	4/29/08
Consent for Removal Action,		2000	
Little Traverse Bay CKD			
Release Site (Docket No.	Printed Name	Signature	Date (M/D/Y)

Signature

EQP 2731 Revised 12/2005 Joint Permit Application Page 3 of 7

10 PROJECTS IMPACTING WETLANDS OR FLOODPLAINS OR LOCATED	
Check boxes A through N that may be applicable to your project and provide	
If your project may affect wetlands, also complete Section 12. If your project	
	other water features; existing <i>structures</i> ; and the location of all proposed <i>structures</i> , land
	view sample drawings for guidance in completing site-specific drawings for your project.
Some projects on the Great Lakes require an application for conveyance pri	
•	ill water elevation. On inland waters, ☐ NGVD 29 ☐ local datum ☑ other <i>NAVD 88</i>
Observed water elevation (ft) 657.8 at Monitoring Well 2144,      DROUGEST PERSONNEL SHAPE OF THE PROPERTY OF THE PROPERT	date of observation (M/D/Y) 04/15/08
A. PROJECTS REQUIRING FILL (See All Sample Drawings)	a fact (ft) times the guarage width (ft) times the guarage doubt (ft) and divide by 27
	n feet (ft) times the average width (ft) times the average depth (ft) and divide by 27.
Attach both plan and <i>cross-section</i> views to scale showing maximum and (Check all that apply)	u average in differsions.  ☐ riprap ☐ seawall, bulkheaa, or revetment ☐ bridge or culvert
boat launch off-shore swim area beach sanding	boatwell crib dock other
Fill dimensions (ft)	Total fill volume (cu yd)  Maximum water
Length width maximum depth	depth in fill area (ft)
Type of clean fill pea stone sand gravel	Will <i>filter fabric</i> be used under proposed fill?
wood chips other	No ☐ Yes (If Yes, type)
· -	
	commercial other, If other, attach description of location
Fill will extend feet into the water from the <i>shoreline</i> and <i>upland</i>	feet out of the water. Fill volume below OHWM (cu yd)
	projects see Sample Drawing 7, for excavation see other applicable Sample Drawings)
	n feet (ft) times the average width (ft) times the average depth (ft) and divide by 27.
Attach both plan and <i>cross-section</i> views to scale showing maximum and the section of the	d average dredge or excavation dimensions.
The applicant will be notified if sediment sampling is required.    Check all that applied	dradas or draining coquall hull/hood arrayatment
	dredge or draining seawall, bulkhead, or revetment
navigation boat well boat laur  Total dredge/excavation Dimensions	nch other Dredge/excavation volume below Method and equipment for dredging
	dredged or excavated spoils be placed  on-site off-site. Attach a detailed disposal area
	plan, location map. If dispose off site, provide address and letter of authorization.
Has this same area been previously dredged? No Yes (If Yes, pro	
If Yes, are you proposing to enlarge the previously dredged area No	
Is long-term maintenance dredging planned? No Yes (If Yes, wher	
C. PROJECTS REQUIRING RIPRAP (See Sample Drawings 2, 3, 8, 12,	
Riprap waterward of the shoreline OR ordinary high water mark	Dimensions (ft) length width depth Volume(cu yd)
Riprap landward of the shoreline OR ordinary high water mark	Dimensions length width depth Volume(cu yd)
	Will <i>filter fabric</i> be used under proposed <i>riprap</i> ? ☐ No ☐ Yes
Type of <i>riprap</i> I field stone angular rock other	(If Yes, type)
D. SHORE PROTECTION PROJECTS (See Sample Drawings 2, 3, and 1	
(check all that apply)	Distances of project
riprap – length (ft.) seawall bulkhead – length (ft.)	revetment – length (ft.) from both property lines (ft)
E. DOCK - PIER – MOORING PILINGS (See Sample Drawing 10)	
Type open pile filled crib	Seasonal structure? No Yes
Proposed <i>structure</i> dimensions (ft) length width	Dimensions of nearest adjacent <i>structures</i> (ft) length width
F. BOAT WELL (No Sample Drawing available)	
Type of bank stabilization wood steel concrete vinyl	riprap other
Boat well dimensions (ft)	Number of boats
Length width depth	
Volume of backfill behind sidewall stabilization (cu yd)	Distances of boat well from adjacent property lines (ft)
G. BOAT LAUNCH (No Sample Drawing available) (check all that apply)	new existing public private commercial replacement
Proposed overall boat launch dimensions (ft)	Type of material concrete wood stone other
length width depth	31
Existing overall boat launch dimensions (ft)	Boat launch dimensions (ft) below <i>ordinary high water mark</i>
Length width depth	Length width depth
	mber of Skid <i>pier</i>
	d piers dimensions (ft) width length
H. BOAT HOIST (No Sample Drawing available)	
	MA
	lifter " " " " " " " " " " " " " " " " " " "
other	located on seawall dock bottomlands
I. BOARDWALKS AND DECKS IN WETLANDS - OR - FLOODPL	located on seawall dock bottomlands

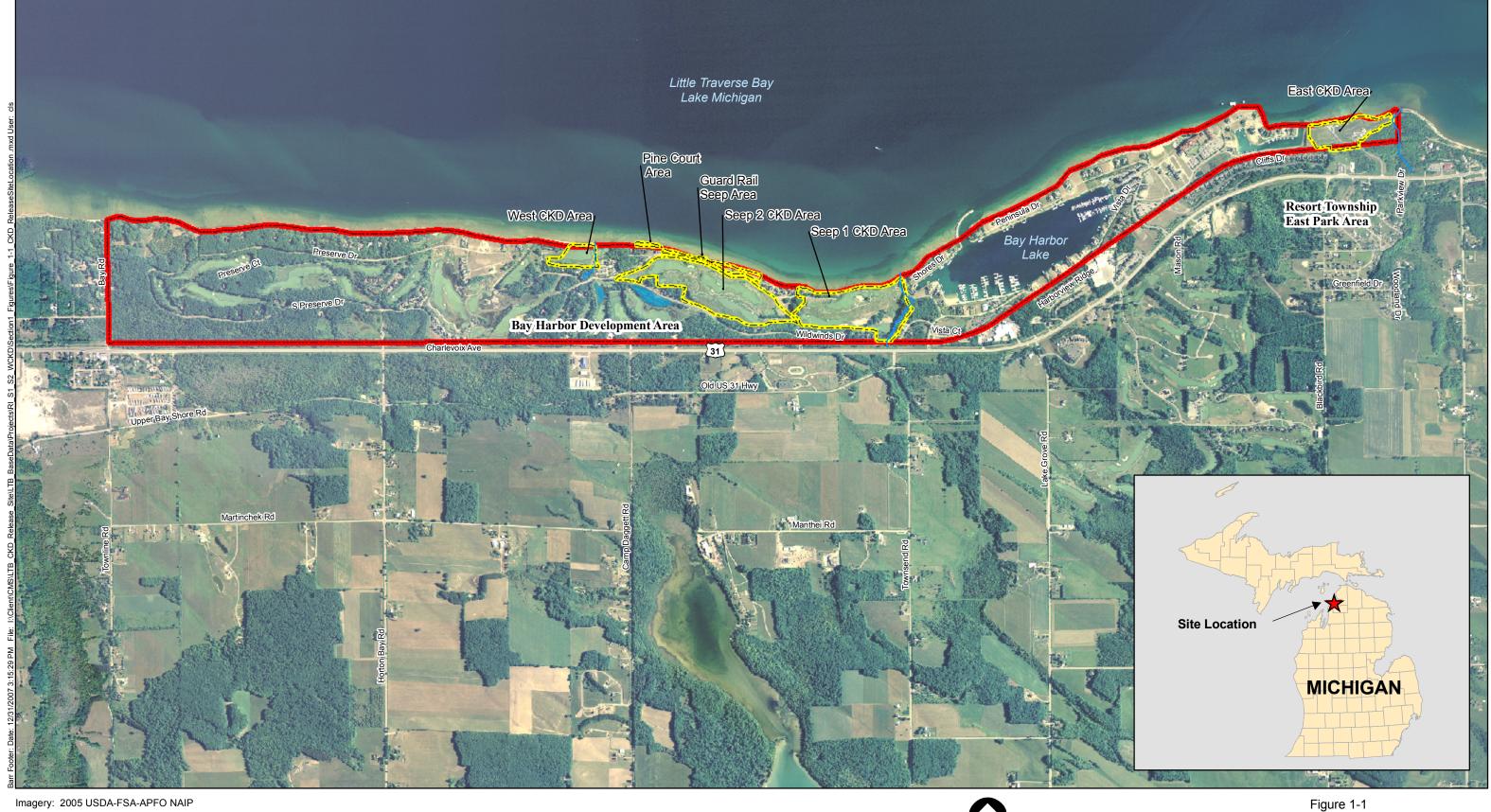
40 O U L DDO IFOTO IMP	A OTINIO METLANDO	OD EL OODDL AING O	D LOCATED ON AN	INII AND LAKE O	D CTDEAM OD A O	DEATLAKE
10 Continued - PROJECTS IMP				INLAND LAKE O	R STREAM OR A G	REAT LAKE
J. INTAKE PIPES (See Sample Dr Type headwall end se			let pipe, discharge is t	to wetland	inland lake	
<u> </u>	JUII		tream, drain, or river	Great Lake		
pipe other Dimensions of headwall		<u> </u>				ameters and invert
	width	donth		Number of pipes	•	
OR end section (ft) length  K. MOORING AND NAVIGATION	width	depth			elevati	ULIS
			anna frama tha albara ta	مام مام مام م	lanth of water at analy	huau in fact
<ul><li>Provide an overall site plan sho</li><li>Provide cross-section drawing(s</li></ul>				each buoy, and d	lepin of water at each	i buoy in reet.
	Type of ancl			Durage of busy		destion D sudmember
Number of buoys Dimensions of buoys (ft)	1 ype or and	,		Purpose of buoy		vigation swimming
, , ,	olaht		ou own the property al			
	eight	IT INO	, you must provide an	authorization letter	r from the property of	wner(s)
L. GROINS (No Sample Drawing a	(Vallable)	the outerment are/no	fram the property line.	a diatamasa hatus	on araino lonath one	Luddth of oodb arola
<ul> <li>Provide an overall site plan show and the distance from the existin</li> </ul>	a too of the bluff to the l	the outermost <i>groins</i>	rom the property lines	s, distances betwe	en <i>groins</i> , iengin and	i widin of each <i>groin</i> ,
<ul> <li>If existing <i>groins</i> are located on a</li> </ul>				arainta vaur propa	orty lines on the site r	olon
Provide <i>cross-section</i> views show						
show the height of each section			The meight of grown end	as above the obser	ved water lever (date	and times. If step down type,
Number of <i>groins</i>	Type of <i>groin</i> steel		Will <i>groin</i> be placed o	n a foundation?	No Yes (If Yes	s, dimensions of foundation
3	other	_	(ft)) length	width	heigh	
M. FENCES IN WETLANDS, STR		JNS (No Sample Dray			<u></u>	
Provide an overall site plan show				S.		
<ul> <li>Provide drawing of fence profile</li> </ul>					nd to bottom of fence	e (if in a <i>floodplain</i> ).
(check all that apply)		I length (ft) of fence th				type and material
wetlands streams flood	<i>plain</i> s wetla	ands streams	<i>floodplain</i> s			
N. OTHER - e.g., structure removal				ndations in wetland	ds or <i>floodplain</i> s	
	,		,		, , , , , , , , , , , , , , , , , , ,	
11 EXPANSION OF AN EXISTING O	R CONSTRUCTION O	F A NFW I AKF OR	POND (See Sample D	rawings 4 and 15)		
Which best describes your proposed wat			(00000000000000000000000000000000000000			
wildlife stormwater retention			recreation	wastewater basin	other	
Water source for lake/pond						
groundwater natural springs	☐ Inland Lake or S	<i>tream</i> stormwat	er runoff 🔲 pump	sewage	other	
Location Of the lake/basin/pond	floodplain	wetland				
·	<u></u>				17\	
Will project involve construction of a dam			No Yes (If Yes,	, complete Section	17)	
12 ACTIVITIES THAT MAY IMPACT			shalta ar aall F17 272	1170		
• For information on the MDEQ's <i>Wet</i> a (check all that apply)		excavation (Section			n 10I) 🔲 dewaterir	na
		•	· —			y <b>stallation under</b>
·	on 10M) Dridges ar		,	y surface water \( \bullet	∆ other <b>utility in</b>	
A wetland deliniation				any, if fordered 1	Amplicant nurshacad	wetland
Has a professional wetland delineation b method was used, supply data sheets)	een conducted for this p	Darcer? 🔼 NO 🔲 YE	s (ii Yes, provide a co	opy; ii iederai   #	Applicant purchased p	after October 1, 1980.
	o proporty? No C	7 Vac /If Vac provide	the number)	<u> L</u>	before OR	allel Octobel 1, 1900.
Is there a recorded DEQ easement on the			·			
Has the MDEQ conducted a wetland ass	essment for this parcel?	No Yes (If	Yes, provide a copy)			
Describe the wetland impacts, proposed	•				•	3.
mitigation proposed if more than 1/3 acre	· ·	•		•		_
method. The boring will be in	stalled at a minin	num of 48 inches	s below the wetl	and surface.	The entrance al	nd exit locations of
the bore will be located in upl	ands outside of the	he wetland.  Erd	sion control met	thods will be u	ised as necessai	ry at the entrance
and exit locations. A plan for	preventing and co	ontrolling the los	s of drilling mud	l into the wetl	land is attached	<i>l.</i>
Is any grading or mechanized land cleari			Has ar	ny of the proposed	grading or mechaniz	ed land clearing been
(If Yes, show locations on site plan)	ig proposeu? 🔼 No 📙	162	comple	eted? 🛛 No 🗌	Yes (If Yes, label ar	nd show locations on site
, ,			plan)			
<ul> <li>Complete the wetland dredge and wet</li> </ul>						
<ul> <li>Attach additional sheets if necessary a</li> </ul>					e typical <i>cross-sectio</i>	on for each wetland
dredge and/or fill area. Also complete						
If dredge material will be disposed of control of the disposed o				e soil erosion and s		
Wetland dredge dimensions	maximum length (ft)	maximum width (ft)	dredge area		average depth (ft)	dredge volume (cu yd)
Wetland will not be dredged			acres sq ft			
Wetland fill dimensions	maximum length (ft)	maximum width (ft)	fill area		average depth (ft)	fill volume (cu yd)
Wetland will not be filled			acres sq ft			
Total wetland dredge area				wetland	_	
acres sq ft O				e volume (cu yd) (	0	
Total wetland fill area				wetland		
acres sq ft 0			fill volu	ume (cu vd) <i>O</i>		

If wetlands will be impacted, also complete Section 12.		
ype of drawdown 🔲 over winter 🔲 temporary 🔲 one-time e	vent 🔲 annual event 🔲 permanent (dam re	emoval) other
eason for drawdown		
		Previous MDEQ permit
as there been a previous drawdown? 🗌 No 🔲 Yes (If Yes, pro	vide date (M/D/Y) / /	number, if known
oes waterbody have established legal lake level?  No  Ye:	s Not Sure	Dam ID Number, if known
xtent of vertical	Impoundment	Number of adjacent or
rawdown (ft)	design head (ft)	impacted property owners
ate drawdown would start	Date drawdown	Rate of drawdown
Λ/D/Y) / /	would stop (M/D/Y) / /	(ft/day)
ate refilling would start	Date refill	Rate of refill
//D/Y) / /	would end (M/D/Y) / /	(ft/day)
ype of outlet discharge structure to be used	Impoundment area at	Sediment depth behind impoundment
surface bottom mid-depth	normal water level (acres)	discharge structure (ft)
Detailed engineering plans are required once the activity has Attach detailed engineering plans for a dam repair, dam alterahich one best describes your project? new dam construction dam repair dam alteration dam abandonment	ation, dam abandonment, or dam removal.	enlargement of an existing <i>dam</i>
		ities require a drawdown of the waterbody to complete the
known surface [	☐ bottom ☐ mid depth work? ☐ No ☐	Yes (If Yes, also complete Section 16)
<i>Piprap</i> Dredging/exc	cavation Fill volume	Does structure allow complete
olume (cu yd) Volume (cu y	(cu yd)	drainage of waterbody?   No Yes
enchmark Datum used		e benchmark and show on plans
	/D 20 Dathar	
evation (ft) Local NGV		
evation (ft) Local NGV		number, and mailing address)
evation (ft) Local NGV		number, and mailing address)
	er? No Yes (If Yes, name, registration	Ç .
evation (ft)	er? No Yes (If Yes, name, registration  Yes (If Yes, describe how the stream flow will	be controlled through the <i>dam</i> construction area during the

elevation (ft)  Embankment length (ft)  Proposed normal pool elevation (ft)  Have soil borings been taken at	embankme Embankme  dam location?  it application)  See Sample Drawings complete Subsections the requested information in the requested information in the consings?	Impoundment flood elevate  Will a color (If Yes, in 12 and 13)  10A and 10B. If spoils will	and streambed electric nkment bottom width (ft)  ion (ft) Maximum various proposed streamber underspill be proved a vater underspill be proved by the placed in wetlands or ple crossings.	evation at downstre  Embankment si (vertical / horizon vertical drawdown of tructure, if available vided?  wetlands may be  Crossing of international wetle length per crossing (ft.)	ntal) Downstream capability (ft) (Attach opera e)  Do you have flowage rig flooded property at the c No Yes	tional procedure of the phts to all proposed design flood elevation?  In 12.  In 12.  In 12.  In 12.  In 12.
Embankment length (ft)  Proposed normal pool elevation (ft)  Have soil borings been taken at No Yes (If Yes, submit results with perm  18 UTILITY CROSSINGS (Solf side casting is required, or Attach additional sheets with What method will be used to cor Ifume plow open  Type  Sanitary sewer	embankme Embankme  dam location?  it application)  Gee Sample Drawings complete Subsections th the requested informatruct the crossings?  trench	ent toe (ft) ent top width (ft)  Emba  Impoundment flood elevati  Will a coli  No [ (If Yes, in 12 and 13) 10A and 10B. If spoils will mation as needed for multi  Number of inland lake or stream crossings	and streambed electric nkment bottom width (ft)  ion (ft) Maximum various proposed streamber underspill be proved by Yes  invert elevation (ft.)  I be placed in wetlands or ple crossings.  g  Pipe diameter (in.)  2 - 10"  boreholes each with one 4" pipe	evation at downstre  Embankment si (vertical / horizon vertical drawdown of tructure, if available vided?  wetlands may be  Crossing of international wetle length per crossing (ft.)	am embankment toe) (ft)  lopes Upstream Intal) Downstream  capability (ft) (Attach operate)  Do you have flowage rig flooded property at the complete Section  Inland Lake or Stream laters wetlands (also complete Distance below streamber wetland (in.)	tional procedure of the ghts to all proposed design flood elevation?  In 12.  If loodplain omplete Section 12) d or Trench width (ft.)
elevation (ft)  Embankment length (ft)  Proposed normal pool elevation (ft)  Have soil borings been taken at  No Yes (If Yes, submit results with perm  18 UTILITY CROSSINGS (S  If side casting is required, o  Attach additional sheets wi What method will be used to cor  Ifume plow open	embankme Embankme  dam location?  it application)  Gee Sample Drawings complete Subsections th the requested informatruct the crossings?  trench	ent toe (ft) ent top width (ft)  Emba  Impoundment flood elevati  Will a col  No (If Yes, in  12 and 13)  10A and 10B. If spoils wil mation as needed for multi  bore directional drillin Number of inland lake or	and streambed electric nkment bottom width (ft)  ion (ft) Maximum various proposed so divided water underspill be proved by the proved placed in wetlands or ple crossings.	Embankment si (vertical / horizonertical drawdown of tructure, if available rided?  wetlands may be  Crossing of international well-	am embankment toe) (ft)  lopes Upstream Intal) Downstream  capability (ft) (Attach operate)  Do you have flowage rig flooded property at the complete Section  Inland Lake or Stream laters wetlands (also complete Distance below streambe	tional procedure of the ghts to all proposed design flood elevation?  In 12.  If floodplain complete Section 12)
elevation (ft) Embankment length (ft)  Proposed normal pool elevation (ft) Have soil borings been taken at No Yes (If Yes, submit results with perm  18 UTILITY CROSSINGS (S  If side casting is required, o  Attach additional sheets wi What method will be used to cor	embankme Embankme  dam location?  it application)  See Sample Drawings complete Subsections th the requested infornation instruct the crossings?  trench  jack and	ent toe (ft) ent top width (ft)  Emba  Impoundment flood elevati  Will a col  No  (If Yes, in  12 and 13)  10A and 10B. If spoils wil mation as needed for multi  bore directional drillin	and streambed electric nkment bottom width (ft)  ion (ft) Maximum various proposed streamber underspill be proved a vater underspill be proved by the placed in wetlands or ple crossings.	Embankment si (vertical / horizonertical drawdown of tructure, if available vided?  wetlands may be  Crossing of  international w	am embankment toe) (ft)  lopes Upstream Intal) Downstream  capability (ft) (Attach operate)  Do you have flowage rig flooded property at the compacted, complete Section  Inland Lake or Stream laters wetlands (also compacted)	tional procedure of the phts to all proposed design flood elevation?  In 12.  In 12.  In 12.  In 12.  In 12.
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, , , , , , , , , , , , , , , , , , ,	, ,		1 3 3			
<ul> <li>The following additional info</li> <li>Describe the type of dam and ho</li> </ul>						
Will a water diversion during cor proposed project activities)	nstruction be required?	P No Yes (If Yes, d	lescribe how the stream fl	ow will be controlle	ed through the <i>dam</i> constru	ction area during the
Have you engaged the services				stration number, ar	nd mailing address)	
Benchmark elevation (ft)	Datum use		her	Describe benchma	ark and show on plans	
Volume (cu yd)		Volume (cu yd)	(cu yd)	ļ	ainage of waterbody?   N	lo Yes
Riprap		Dredging/excavation	Fill volume		oes <i>structure</i> allow complete	
If known		surface bottom			s, also complete Section 16	
☐ dam repair ☐ dam alte Dam ID Number		ndonment dam Type of outlet discharge s		other activities require	e a drawdown of the waterb	andy to complete the
Which one best describes your p			nstruction of a <i>failed dam</i>		pement of an existing dam	
<ul><li>Detailed engineering plans</li><li>Attach detailed engineering</li></ul>	g plans for a <i>dam</i> repa	ir, <i>dam alteration, dam ab</i>	<i>andonment</i> , or <i>dam</i> remov	val.	•	
Attach site-specific concep  Detailed angine site and plane						e impact review.
<ul> <li>If wetlands will be impacted</li> </ul>			710 TTTTLO (GGG Gampi	io Diawing 10)		
Drum Lindrustan D	·		mal water level (acres)  ACTIVITIES (See Sample)	le Drawing 15)	discharge <i>structure</i> (ft)	
17 DAM, EMBANKMENT, D	mid-depth	· · · · · · · · · · · · · · · · · · ·	poundment area at		Sediment depth behind	impoundment
surface bottom	e to be used		uld end (M/D/Y)	/	(ft/day)	
	re to be used	WOI			Rate of refill	

# Attachment No. 1

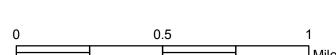
Site Figures



Approximate Site Boundary

CKD Investigation Area

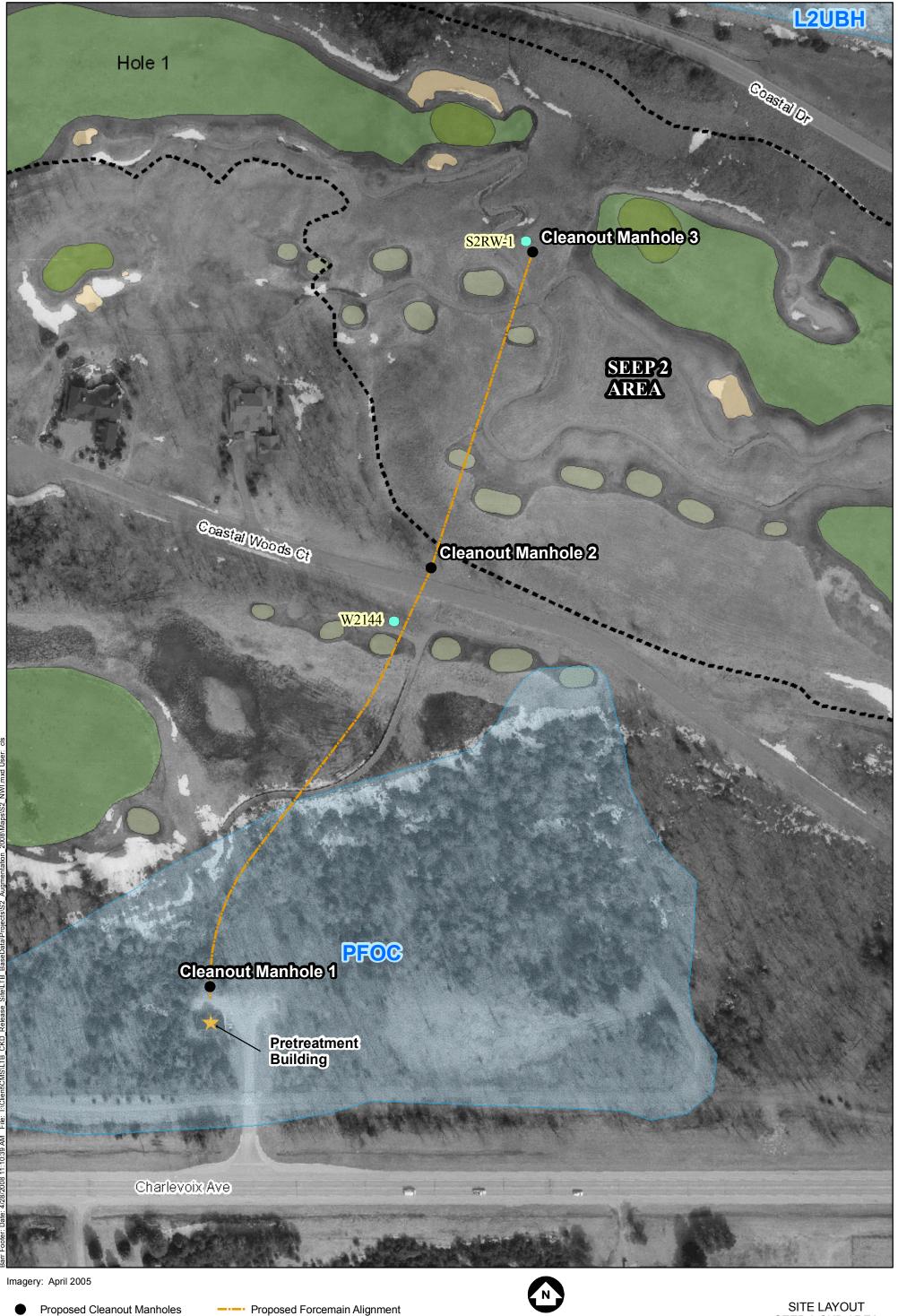
Pond/Wetland



rigule 1-1

CKD RELEASE SITE LOCATION
Little Traverse Bay
CKD Release Site
Emmet County, Michigan





Proposed Cleanout MPretreatment Building

Proposed Forcemain Alignment

National Wetland Inventory

Approximate CKD Extent



125

62.5

125

∃Feet

SITE LAYOUT SEEP 2 CKD AREA Little Traverse Bay CKD Release Site Emmet County, Michigan



# CMS LAND COMPANY LITTLE TRAVERSE BAY CKD RELEASE SITE SEEP 2 AUGMENTATION EMMET COUNTY, MICHIGAN



# LOCATION MAP



VICINITY MAP

THREE FULL WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG

#### WARNING

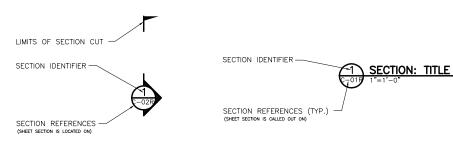
UTILITY LOCATIONS ARE APPROXIMATIONS SHOWN WERE OBTAINED FRO

#### INDEX

SHEET NO.	<u>TITLE</u>
C-01	. Seep 2 Augmentation — Title Sheet, Index, and Site Location Map
C-02	. Seep 2 Augmentation — Forcemain Plan & Profile Sta. 1+50 to 7+50
C-03	. Seep 2 Augmentation — Forcemain Plan & Profile Sta. 7+50 to 13+33
C-04	. Seep 2 Augmentation — Forcemain Sections & Details
E-01	. Seep 2 Augmentation — Electrical Plan & Details

#### **PROJECT NOTES:**

1. ALL WORK SHALL BE CONDUCTED IN ACCORDANCE WITH THE SITE HEALTH AND SAFETY PLAN, REVISION 5 (MAY 1, 2006).

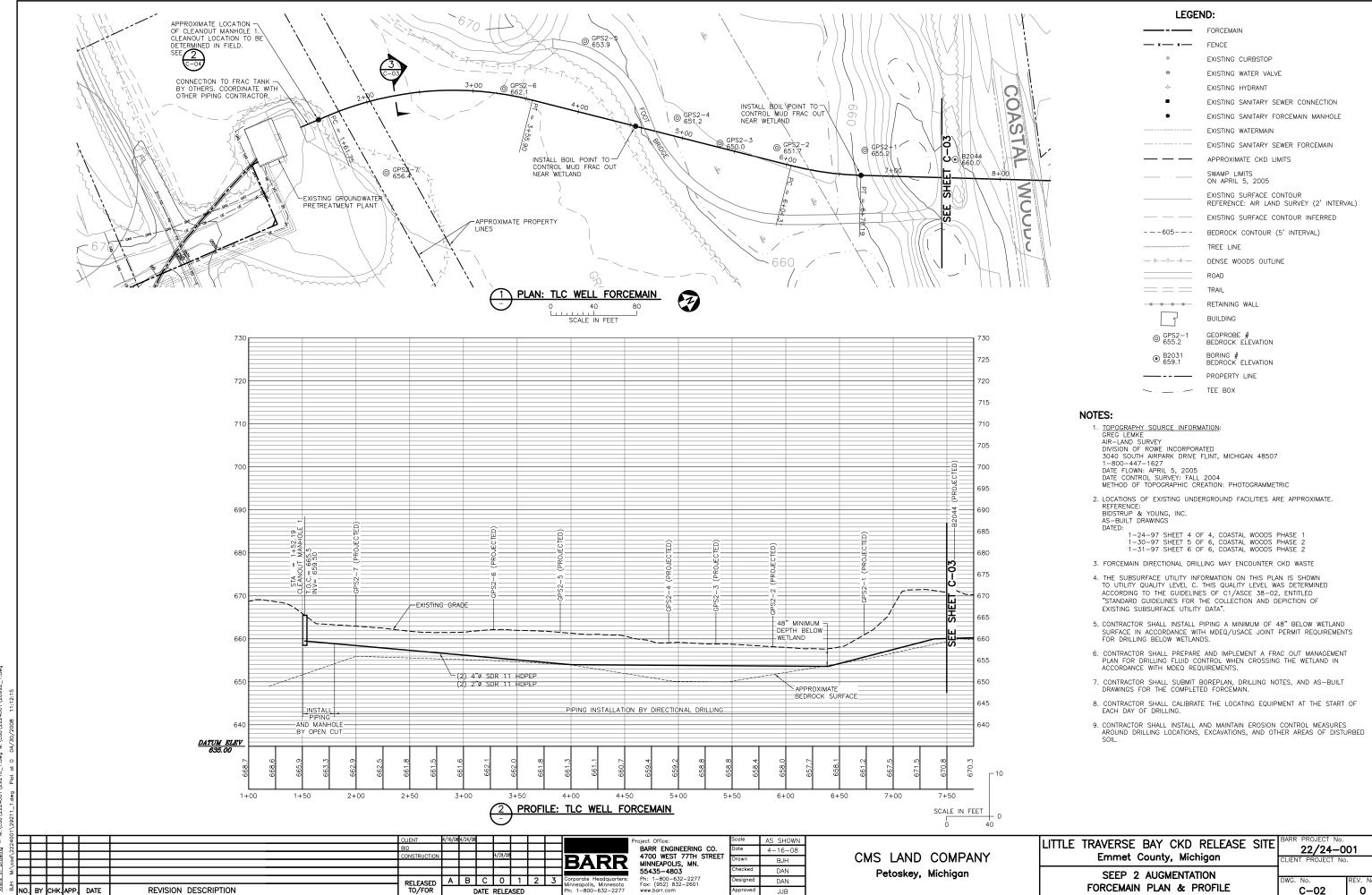


SECTION VIEW CALL OUT

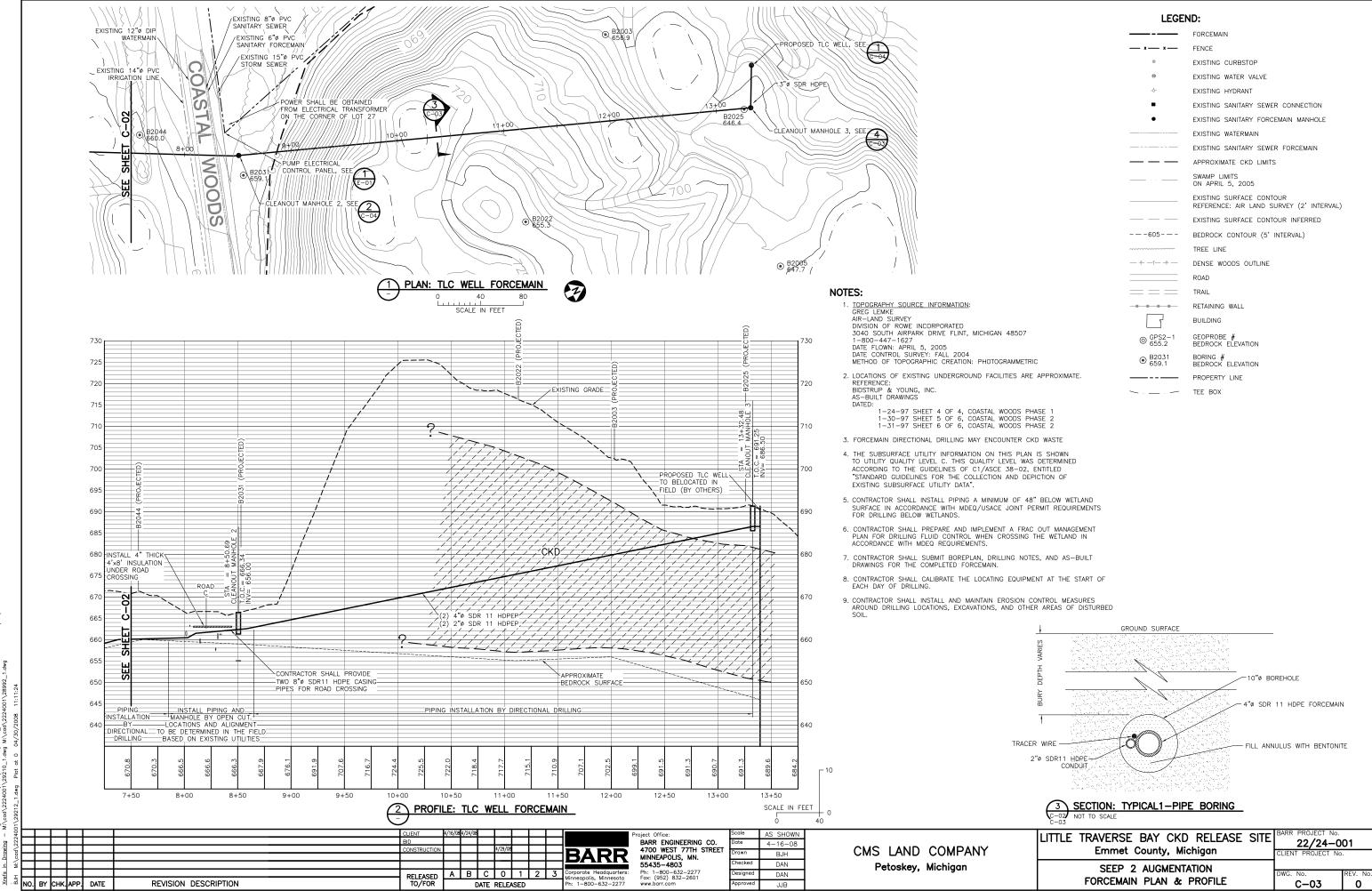
SECTION VIEW TITLE

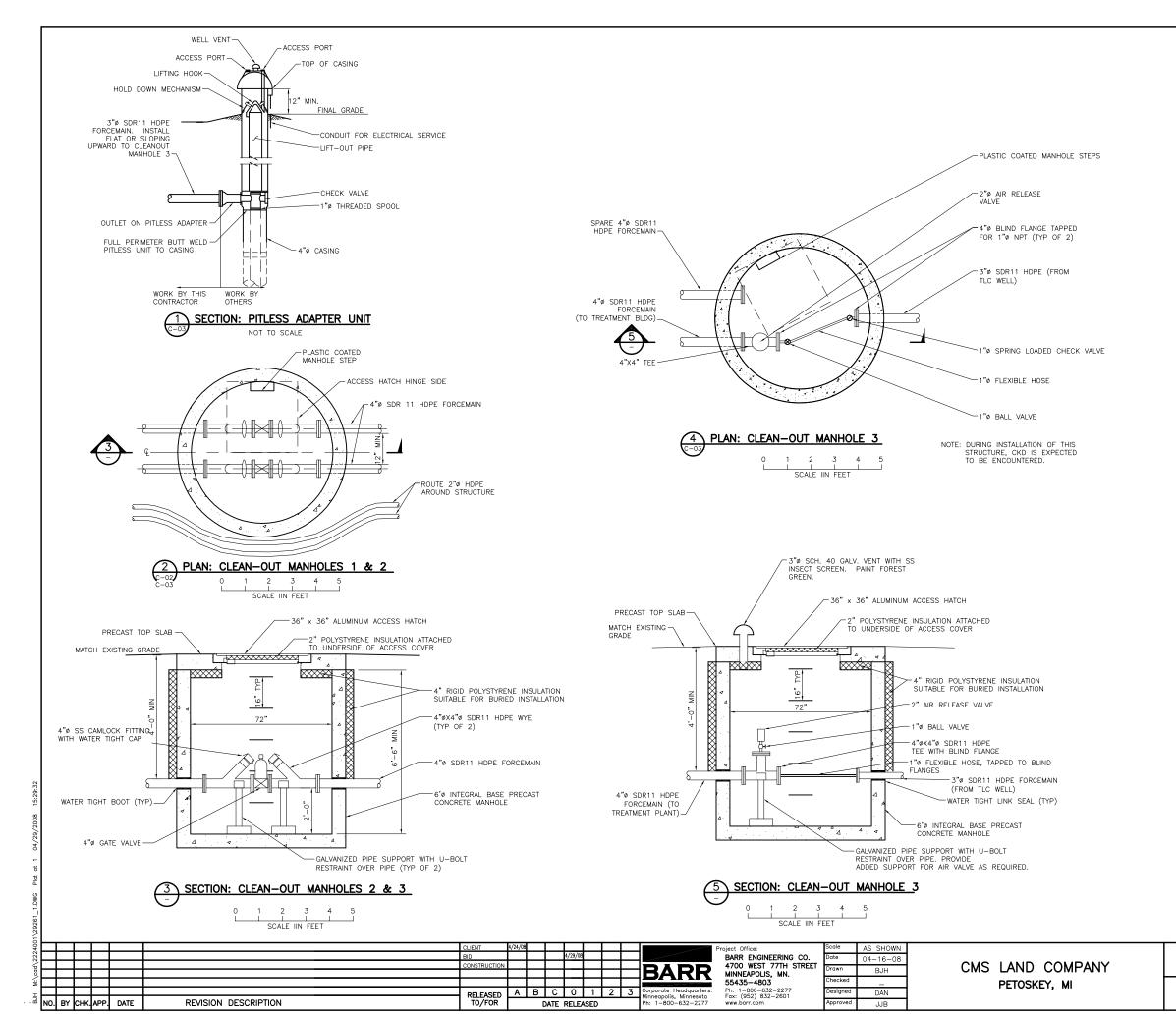
95		$\bot$		CLIENT	4/24/08					Project Office:	Scale	AS SHOWN		LITTLE TRAVERSE BAY CKD RELEASE SITE	BARR PROJECT No.
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86 L	+	-		CONSTRUCTIO	N	+		$\vdash$		4700 WEST 77TH STREET	Drawn	B.IH	CMS LAND COMPANY	Emmet County, Michigan	CLIENT PROJECT No.
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ğı L	+				, <u> </u>		0   1	2   3	Minneapolis Minne	riters: Pn: 1-800-632-22// sota Fax: (952) 832-2601	Designed	DAN	j		DWG. No. REV. No.
·퇴료	O. BY C	HK. APP. D	TE REVISION DESCRIPTION	TO/FOR		DATE RE	LEASED		Ph: 1-800-632-	277 www.barr.com	Approved	JJB		TITLE SHEET, INDEX, AND SITE LOCATION MAP	C-01 0

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. USER: Brian Hughes FILE: M:\CAD\2224001\29211\_1.DWG PLOT SCALE: 1:2 PLOT DATE: 4/30/2008 11:1





#### EXECUTION:

OVEREXCAVATE FOR STRUCTURES TO MIN. 6 INCHES BELOW BASE, PLACE STRUCTURE ON MDOT DENSE GRADED AGGREGATE 22A, COMPACTED PER TABLE BELOW.

BACKFILL WITH MAX. 8" LIFTS USING NATIVE MATERIAL OR IMPORTED BACKFILL CONFORMING TO MDOT CLASS I IMPORT, COMPACTED PER TABLE BELOW

BED PIPES ON CLEAN SAND WITH 100% PASSING THE 3/8" SIEVE AND NO MORE THAN 10% PASSING THE NO. 100 SIEVE, COMPACTED PER TABLE BELOW.

COMPACT TO THE FOLLOWING MINIMUM DENSITIES:

LOCATION	DEHSITY
UNDER STRUCTURES	98% OF MAX.
TOP 2 FEET UNDER PAVEMENT AND GRAVEL ROADS, DRIVES AND PARKING	98% OF MAX.
BELOW TOP 2 FEET UNDER PAVEMENT AND GRAVEL ROADS, DRIVES AND PARKING	90% OF MAX.
PIPE BEDDING	95% OF MAX.
TRENCHES THROUGH UNPAVED AREAS AND FILL AREAS	90% OF MAX.
BESIDE STRUCTURE WALLS	90% OF MAX.

MAXIMUM DENSITY: ASTM D698 - MOISTURE-DENSITY RELATIONS OF SOILS AND SOIL-AGGREGATE MIXTURES USING 5.5 LB (2.49 KG) RAMMER AND 124N. (305MM)DROP (ALSO REFERRED TO AS STANDARD PROCTOR). MOISTURE CONTENT AT -0%+2% OF OPTIMUM.

HYDROSTATIC PRESSURE TEST ALL PIPE TO 50 PSI FOR 2 HOURS PER PIPE MANUFACTURER'S RECOMMENDATIONS.

RESTORATION OF GOLF COURSE AREAS TO BE COMPLETED BY OTHERS. ALL AREAS DISTURBED FOR CONSTRUCTION SHALL BE RESTORED IN KIND. ALL AREAS DISTURBED BY EXCAVATION SHALL BE RESTORED TO THE EXISTING GRADES.

LITTLE TRAVERSE BAY CKD RELEASE SITE EMMET COUNTY, MI

BARR PROJECT No.

22/24-001

CLIENT PROJECT No.

SECTIONS AND DETAILS

DWG. No. REV. No.

### Attachment No. 2

EPA Correspondence



# UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 5 EMERGENCY RESPONSE BRANCH 9311 GROH ROAD GROSSE ILE, MICHIGAN 48138

REPLY TO ATTENTION OF: Brian Kelly

April 8, 2008

VIA EMAIL

David R. Sporer CMS, Project Coordinator One Energy Plaza Jackson, Michigan 49201

Re: Modification to Approval of Augmentation

Administrative Order on Consent (VW-05-C-810)

Dear Mr. Sporer:

Pursuant to discussions between CMS' Chief Executive Officer and U.S. EPA Region 5 management, I am modifying the augmentation milestone and completion dates included in my March 26, 2008 letter as follows:

- West CKD augmentation milestones and completion dates:
  - o Phase 1 Conceptual Design completion by May 1, 2008,
  - o Phase 2 Design Investigation completion by June 1, 2008,
  - o Phase 3 Preliminary Design completion by July 1, 2008,
  - o Phase 4 Final Design completion by September 15, 2008,
  - o Phase 5 Initiation of construction by December 1, 2008,
  - o Phase 5 Work completion by March 31, 2009.
- Seep 1 CKD augmentation milestones and completion dates:
  - o Phase 1 Conceptual Design completion by May 1, 2008,
  - o Phase 2 Preliminary Design completion by June 15, 2008,
  - o Phase 3 Final Design completion by July 31, 2008,
  - o Phase 4 Initiation of Construction by October 1, 2008,
  - o Phase 4 Work completion by December 30, 2008.

As discussed during our March 18 meeting, monitoring wells should be included to evaluate barrier efficacy.

- Pine Court Targeted Leachate Collection milestones and completion dates:
  - o Phase 1 Pilot System Design completion by May 1, 2008,

- o Phase 2 Pilot System Construction completion by May 31, 2008,
- o Phase 3 Final Design Investigation completion by May 31, 2008,
- o Phase 4 Final Design Data Evaluation completion by July 31, 2008,
- o Phase 5 Final Design completion by August 31, 2008,
- o Phase 6 Initiation of Final Design Construction by September 1, 2008,
- o Project Completion by November 30, 2008.

As outlined in my February 29, 2008 letter, the rock covering is disapproved. In addition, in the event targeted leachate collection is ineffective, CMS should continue to evaluate other alternatives.

The March 29, 2008 submission date for preliminary designs is tolled.

All milestone and completion dates are inclusive of subtasks per CMS' 2008 Augmentation Schedule submitted to me during our March 18 meeting. These new milestone and completion dates included in this letter become an enforceable part of the approved Work Plan under the above-reference AOC. Please note that failure to comply with these terms, milestones, and completion dates will result in a determination of CMS' noncompliance with the terms and conditions of the AOC. All other terms and conditions of the AOC and the approved Work Plan continue to apply.

If you have any questions concerning these requirements or other issues addressed in this letter, I can be reached at (734) 692-7684.

Sincerely,

Brian Kelly U.S. EPA, OSC

Brai Kelle

cc: Rosauro Delrosario, U.S. EPA

Rachel Schwarz, Odawa Robert Wagner, MDEQ

Scott Kendzierski, Health Department

# UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 5

IN THE MATTER OF:

LITTLE TRAVERSE BAY CKD RELEASE SITE

[Emmet County, Michigan]

Respondents:

Listed in Attachment A

ADMINISTRATIVE ORDER ON CONSENT FOR REMOVAL ACTION

Docket No. 14-W- '05-C-810

Proceeding Under Sections 104, 106(a), and 107 of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. §§ 9604, 9606(a), and 9607

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#### I. JURISDICTION AND GENERAL PROVISIONS

- 1. This Administrative Order on Consent ("Order") is entered into voluntarily by the United States Environmental Protection Agency ("U.S. EPA") and Respondents. This Order provides for the performance of removal actions by Respondents and the reimbursement of Future Response Costs incurred by the United States at or in connection with the Site as more fully defined in Paragraph 8 located in Emmet County, Michigan.
- 2. This Order is issued under the authority vested in the President of the United States by Sections 104, 106(a), and 107 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. §§ 9604, 9606(a) and 9607, as amended ("CERCLA"). This authority has been delegated to the Administrator of the U.S. EPA by Executive Order No. 12580, January 23, 1987, 52 Federal Register 2923, and further delegated to the Regional Administrators by U.S. EPA Delegation Nos. 14-14-A, 14-14-C and 14-14-D, and to the Director, Superfund Division, Region 5, by Regional Delegation Nos. 14-14-A, 14-14-C and 14-14-D.
- 3. U.S. EPA has notified the State of Michigan (the "State") of this action pursuant to Section 106(a) of CERCLA, 42 U.S.C. § 9606(a). Nothing in this Order shall be construed or interpreted as preempting the State from imposing additional requirements with respect to releases of hazardous substances not inconsistent with this Order..
- 4. U.S. EPA and Respondents recognize that this Order has been negotiated in good faith and that the execution of this Order by Respondents and the actions undertaken by Respondents in accordance with this Order do not constitute an admission of fact or law or of any liability. Respondents do not admit, and retain the right to controvert in any subsequent proceedings other than proceedings to implement or enforce this Order, the validity of the findings of facts, conclusions of law, and determinations in Sections IV and V of this Order. Each Respondent agrees to comply with and be bound by the terms of this Order applicable to it and further agrees that it will not contest the basis or validity of this Order or its terms. Respondents agree not to challenge the issuance or enforcement of this Order based on the provisions of Section 128(b) of CERCLA, 42 U.S.C. § 9628(b).

#### II. PARTIES BOUND

- 5. This Order applies to and is binding upon U.S. EPA and upon each Respondent and its successors and assigns according to its terms. Any change in ownership or corporate status of a Respondent including, but not limited to, any transfer of assets or real or personal property shall not alter such Respondent's responsibilities under this Order.
- 6. Respondents CMS Land Company. and CMS Capital LLC (collectively referred to as "CMS") are agreeing to be jointly and severally obligated for carrying out all activities required by this Order. In the event of the insolvency or other failure of either of the foregoing

Respondents to implement the requirements of this Order, the remaining of the foregoing Respondents shall complete all such requirements. Respondent Bay Harbor Company only agrees to be bound to the terms of this Order in accordance with Section XXVIII-A.

7. Respondents shall ensure that their contractors, subcontractors, and representatives comply with this Order. Respondents shall be responsible for any noncompliance with this Order by Respondent's contractors, subcontractors and representatives.

#### III. <u>DEFINITIONS</u>

- 8. Unless otherwise expressly provided herein, terms used in this Order which are defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or in such regulations. Whenever terms listed below are used in this Order or in the appendices attached hereto and incorporated hereunder, the following definitions shall apply:
- a. "CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. §§ 9601, et seq.
- b. "Day" shall mean a calendar day unless otherwise expressly specified. In computing any period of time under this Order, where the last day would fall on a Saturday, Sunday, or federal holiday, the period shall run until the close of business on the next business day.
- c. "Effective Date" shall be the effective date of this Order as provided in Section XXIX.
- d. "Future Response Costs" shall mean all costs, including direct and indirect costs, that the United States incurs in reviewing or developing plans, reports and other items pursuant to this Order, verifying the Work, or otherwise implementing, overseeing, or enforcing this Order on or after the Effective Date up to \$500,000 as provided in Paragraph 37.
- e. "Interest" shall mean interest at the rate specified for interest on investments of the U.S. EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a). The applicable rate of interest shall be the rate in effect at the time the interest accrues. The rate of interest is subject to change on October 1 of each year.
- f. "National Contingency Plan" or "NCP" shall mean the National Oil and Hazardous Substances Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300, and any amendments thereto.

- g. "Order" shall mean this Administrative Order on Consent and all attachments and appendices attached hereto. In the event of conflict between this Order and any appendix, this Order shall control.
  - h. "Parties" shall mean U.S. EPA and Respondents.
- i. "RCRA" shall mean the Solid Waste Disposal Act, as amended, 42 U.S.C. §§ 6901, et seq. (also known as the Resource Conservation and Recovery Act).
  - j. "Respondents" shall mean those Parties identified in Attachment A
- k. "Site" shall mean the Little Traverse Bay CKD Release Site in Resort Township, Emmet County, Michigan and depicted generally on the map attached as Attachment B.
  - 1. "State" shall mean the State of Michigan.
  - m. "Tribe" shall mean the Little Traverse Bay Bands of Odawa Indians.
- n. "U.S. EPA" shall mean the United States Environmental Protection Agency and any successor departments or agencies of the United States.
- o. "Waste Material" shall mean 1) any "hazardous substance" under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); 2) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); and 3) any "solid waste" under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27); and 4) any "hazardous substance" as defined in Section 20101(t) of the Michigan Natural Resources and Environmental Protection Act, 1994 PA 451 as amended.
- p. "Work" shall mean all activities Respondents are required to perform under this Order.

#### IV. FINDINGS OF FACT

. . . .

- 9. Based on available information, U.S. EPA hereby finds that:
- a. The Site is located along the south shore of Little Traverse Bay, including shoreline, just west of the City of Petoskey in Resort Township, Emmet County, Michigan.
- b. The Site is located on a former limestone mining and cement manufacturing plant operated by the Penn-Dixie Company from approximately 1870 through 1980. The active release areas of the Site, defined as Seep 1 and Seep 2, are located along the Little Traverse Bay shoreline adjacent to remnant cement kiln dust (CKD) waste piles, located beneath portions of the resort's 27-hole golf course. These remnant waste piles were formerly referred to as the Eastern West CKD pile and the Central West CKD pile.

- c. The Site was previously owned by Holnam, Inc. (predecessor to Holcim USA, Inc.). Portions of the Site are now owned by Bay Harbor Golf Course, Inc., a wholly-owned subsidiary of Boyne USA, Inc. with access roads owned by Bay Harbor Company.
- d. In 1994, Respondents CMS Land Company, CMS Capital Corp, Boyne USA, Inc. and Bay Harbor Company among others entered into an "Administrative Agreement and Covenant Not to Sue" dated July 11, 1994 (AACNTS) in connection with the redevelopment of the Site.
- e. Pursuant to the AACNTS, the Respondents performed a number of activities at the Site, including reshaping of CKD waste piles and consolidation of CKD waste piles, and installation of a collection trench system near the base of the Central West CKD waste pile to intercept leachate generated by the pile. Subsequently, a leachate pre-treatment system was installed to manage collected leachate prior to discharge to the City of Petoskey's wastewater treatment plant.
- f. The pre-treatment plant for the subsurface leachate collection system along the Central West CKD pile was shut down for a period of time beginning in approximately January 2004.
- g. Leachate discharge from the Central West CKD waste pile was observed impacting the shoreline of Little Traverse Bay during a routine visit by the Michigan Department of Environmental Quality (MDEQ) on August 17, 2004. At that time, a visible reddish-brown discharge was observed to be releasing to the lake along a 600-foot section of the lakeshore. This release has been referred to as Seep 2.
- h. Subsequent MDEQ investigations in August and September, 2004 documented discharges associated with Seep 2 with a pH of 12 standard units (s.u.) and above. In addition, surface water pH readings were measured consistently between 9.0 and 9.5 s.u. ( over the Michigan water quality standard of 9.0) as far offshore as approximately 90 feet along the visible Seep 2 release area.
- i. MDEQ performed additional investigation at the Site pursuant to its Site visit in August, 2004 The report of this investigation is entitled: An Investigation of the Cement Kiln Dust Seep Discharge into Little Traverse Bay at Bay Harbor, September 7-8, 2004, Emmet County, MDEQ Water Bureau. This report documented numerous exceedances of Michigan Water Quality parameters in the seep 2 leachate and waters of Lake Michigan and concluded that exposure to the CKD leachate will have injurious effect on the public health, wildlife, and aquatic life.
- j. The operation of the pretreatment plant was reported to have been restarted during September 2004.
- k. Subsequent investigations by the U.S. EPA conducted on September 30, 2004, November 4, 2004, and November 22, 2004 also revealed visible evidence (darkly colored pools

of liquid) of CKD releases in two distinct areas along the Little Traverse Bay shoreline, known as Seep 1 and Seep 2. Monitoring conducted by the U.S. EPA during the site visits with a pH meter has documented readings ranging from 9.98 s.u. to as high as 13.13 s.u. in seep pools along the shoreline throughout the Seep 1 and Seep 2 areas. During the November 4, 2004 site visit, U.S. EPA collected samples from seep pools in the Seep 1 and 2. Analysis of these samples revealed exceedences of Michigan Water Quality Standards for pH and heavy metals.

#### V. CONCLUSIONS OF LAW AND DETERMINATIONS

- 10. Based on the Findings of Fact set forth above and available information, U.S. EPA has determined that:
  - a. The Site is a "facility" as defined by Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).
- b. The contamination found at the Site, as identified in the Findings of Fact above, includes "hazardous substance(s)" as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).
- c. Each Respondent is a "person" as defined by Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).
- d. Each Respondent is a responsible party under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a).
- e. The conditions described in the Findings of Fact above constitute an actual or threatened "release" of a hazardous substance from the facility into the "environment" as defined by Sections 101(22) and 101(8) of CERCLA, 42 U.S.C.§§ 9601(22) and 9601(8).
- f. The conditions present at the Site constitute a threat to public health, welfare, or the environment based upon the factors set forth in Section 300.415(b)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan, as amended ("NCP"), 40 CFR §300.415(b)(2).
- g. The removal action required by this Order is necessary to protect the public health, welfare, or the environment and, if carried out in compliance with the terms of this Order, will be considered consistent with the NCP, as provided in Section 300.700(c)(3)(ii) of the NCP.

#### VI. <u>ORDER</u>

Based upon the foregoing Findings of Fact and the Conclusions of Law and Determinations, it is hereby Ordered and Agreed that Respondents shall comply with all provisions of this Order, including, but not limited to, all attachments to this Order and all documents incorporated by reference into this Order.

#### VII. <u>DESIGNATION OF CONTRACTOR, PROJECT COORDINATOR,</u> AND ON-SCENE COORDINATOR

- 11. Respondents shall retain one or more contractors to perform the Work and shall notify U.S. EPA of the name(s) and qualifications of such contractor(s) within 5 business days of the Effective Date. Respondents shall also notify U.S. EPA of the name(s) and qualification(s) of any other contractor(s) or subcontractor(s) retained to perform the Work at least 5 business days prior to commencement of such Work. U.S. EPA retains the right to disapprove of, for good cause, any or all of the contractors and/or subcontractors retained by Respondents. If U.S. EPA disapproves of a selected contractor, Respondents shall retain a different contractor and shall notify U.S. EPA of that contractor's name and qualifications within 3 business days of U.S. EPA's disapproval. The contractor must demonstrate compliance with ANSI/ASQC E-4-1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs" (American National Standard, January 5, 1995), by submitting a copy of the proposed contractor's Quality Management Plan ("QMP"). The QMP should be prepared consistent with "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA/240/B0-1/002), or equivalent documentation as required by U.S. EPA.
- 12. Within 5 business days after the Effective Date, Respondents shall designate a Project Coordinator who shall be responsible for administration of all actions by Respondents required by this Order and shall submit to U.S. EPA the designated Project Coordinator's name, address, telephone number, and qualifications. To the greatest extent possible, the Project Coordinator shall be present on Site or readily available during Site work. U.S. EPA retains the right to disapprove of the designated Project Coordinator for good cause. If U.S. EPA disapproves of the designated Project Coordinator, Respondents shall retain a different Project Coordinator and shall notify U.S. EPA of that person's name, address, telephone number, and qualifications within 4 business days following U.S. EPA's disapproval. Receipt by Respondents' Project Coordinator of any notice or communication from U.S. EPA relating to this Order shall constitute receipt by all Respondents.
- 13. U.S. EPA has designated Ralph Dollhopf of the Emergency Response Branch, Region 5, as its On-Scene Coordinator ("OSC"). Except as otherwise provided in this Order, Respondents shall direct all submissions required by this Order to the OSC by fax or express mail at:

Ralph Dollhopf U.S. EPA, Emergency Response Section One 9311 Groh Road, Room 216 Grosse Ile, Michigan 48138-1697 Fax: (734) 692-7677

Respondents shall also send one courtesy copy of all submissions to

(1) Rodger Field, Associate Regional Counsel,

Office of Regional Counsel U.S. EPA, Region 5 77 West Jackson Blvd. Chicago, Illinois 60604.

- (2) Rachel Schwarz, Environmental Services Director Little Traverse Bay Bands of Odawa Indians 7500 Odawa Circle Harbor Springs, Michigan 49740
- (3) Robert Wagner, Environmental Manager
  Remediation & Redevelopment Division
  Michigan Department of Environmental Quality
  Cadillac District, Gaylord Field Office
  2100 West M-32
  Gaylord, Michigan 49735
- (4) Scott J. Kendzierski, REHS Director of Environmental Services Northwest Michigan Community Health Agency 220 W. Garfield Charlevoix, MI 49720

Respondents are encouraged, but not required, to make their submissions to U.S. EPA on recycled paper (which includes significant postconsumer waste paper content where possible) and using two-sided copies.

14. U.S. EPA and Respondents shall have the right, subject to Paragraph 12, to change their respective designated OSC or Project Coordinator. U.S. EPA shall notify the Respondents, and Respondents shall notify U.S. EPA, as early as possible before such a change is made, but in no case less than 24 hours before such a change. The initial notification may be made orally but it shall be promptly followed by a written notice.

#### VIII. WORK TO BE PERFORMED

- 15. Respondents shall perform, at a minimum, the following removal activities consistent with the Work Plan approved pursuant to Paragraph 16:
- i. Provide Site security and restrict access to known high-pH "cement kiln dust" (CKD) leachate release areas to the north and east of Coastal Drive (seep areas) by (1) constructing fences or other engineering controls approved by U.S. EPA and (2) posting warning signs which specifically warn of the potential threats associated with direct

contact with the leachate release, and (3) by means of any other security provisions approved by EPA.

The CKD leachate release areas which are currently known are described in Attachment C hereto. (CKD leachate release areas described in Attachment C and those subsequently identified pursuant to subparagraph iii are collectively referred to as "CKD leachate release areas".) For purposes of this Order, "high-pH" means pH at levels above water quality standards established by the State of Michigan.

- ii. Prepare a Site Health and Safety Plan, Site Control and Access Management Plan to carry out the work to be performed under this Order;
- iii. Evaluate all other areas along lakeshore of the Site with pathways for releases to surface waters, including Lake Michigan, with the objective of identifying additional CKD leachate release areas which may not have been identified, but may be causing a threat of direct contact or threat of release of high pH releases to surface waters, including Lake Michigan. The workplan shall identify a method for conducting such evaluation including visual and other indicators of CKD leachate releases;
- iv. Restrict access with (1) fencing or other engineering controls approved by U.S. EPA and (2) posting signs, and (3) any other measures approved by U.S. EPA at CKD leachate release areas identified during evaluation in subparagraph iii above;
- v. Implement recovery of all high-pH leachate from all CKD leachate release areas for treatment on-site and/or arrange for off-site treatment, storage and disposal to the maximum extent practicable as determined by U.S. EPA;
- vi. Continue activities in subparagraph (v) until such time as interim response activities under subparagraph (vii) can be designed, constructed and demonstrated to be effective to prevent high-pH leachate releases to lakeshore areas and surface waters, including Lake Michigan;
- vii. Design, construct and implement operation of interim recovery systems to prevent release of high-pH leachate to lakeshore areas and surface waters, including Lake Michigan, in and from CKD leachate release areas until long-term engineering controls can be designed, constructed and demonstrated to be effective;
- viii. Confirm the effectiveness of the measures set forth in subparagraph (i) to (vii) above and develop and implement a monitoring program that measures releases of high pH leachate and hazardous substances which may continue to be released to surface waters, including Lake Michigan, or lakeshore areas in or from CKD leachate release areas.

- ix. Perform operation and maintenance of the measures set forth in subparagraphs (i) to (vii) above until such time as long-term engineering controls can be designed and constructed and demonstrated to be effective to prevent CKD leachate releases to lakeshore areas and surface waters, including Lake Michigan.
- x. Investigate the nature and extent of hazardous substances, pollutants or contaminants at the Site to determine the nature and extent of current and potential threats to public health, welfare or the environment from CKD Waste Material and evaluate alternatives for addressing such threats that meet the goals described below as part of the long-term remedy and prepare a report of the results of work performed under this subparagraph.

The parties recognize that the work described above is intended as an interim response to releases from the Site. The Respondents agree to negotiate in good faith with the State to enter an enforceable agreement within 120 days from approval of the report set forth in subparagraph x above. The agreement shall provide for the Respondents to carry out further response activities which will accomplish all of the following:

- Integrate the interim response activities provided in subparagraphs (i) through (ix) above as appropriate;
- Prevent unacceptable exposures to surface waters and sediment impacted by CKD Waste Material;
- Design, construct and operate long-term response activity to prevent discharge of groundwater containing hazardous substances above state criteria from the Site to surface waters of the state;
- Prevent unacceptable risk from human direct contact with CKD Waste Material;
- Prohibit exacerbation, prevent new releases and unacceptable exposure and place land use and resource use restriction related to CKD Waste Material;
- Construct and maintain erosion control measures for underlying CKD Waste Material;
- Ensure adequate financial resources are available in an acceptable form and amount to assure the performance of the response activities necessary to protect human health or the environment in perpetuity;
- Ensure that any other unacceptable exposures are adequately addressed and assure the effectiveness and integrity of the long-term response activities.

These goals will be achieved through (a) removal of CKD Waste Material, or (b) containment and isolation of CKD Waste Material, or (c) other engineering controls with equivalent or superior effectiveness to containment and isolation; (a) through (c), either singly or in combination, shall achieve the goals listed above. U.S. EPA reserves the right to take further enforcement action for investigation, containment, isolation or removal of CKD Waste Material in the event that Respondents fail to comply with the subparagraphs (i) through (x) of this paragraph.

#### 16. Work Plan and Implementation.

- a. Within 10 business days after the Effective Date, Respondents shall submit to U.S. EPA for approval a draft Work Plan for performing the removal action generally described in Paragraph 15 above. The draft Work Plan shall provide a description of, and an expeditious schedule for, the actions required by this Order. The draft Work Plan shall include a Quality Assurance Quality Control plan for approval which meets the requirements of Paragraph 18 below.
- b. U.S. EPA may approve, disapprove or require revisions to the draft Work Plan in whole or in part. If U.S. EPA requires revisions, Respondents shall submit a revised draft Work Plan within 7 business days of receipt of U.S. EPA's notification of the required revisions. U.S. EPA may then approve, disapprove, require revisions to, or modify the revised Work Plan in whole or part. Respondents shall implement the Work Plan as approved in writing by U.S. EPA in accordance with the schedule approved by U.S. EPA. Once approved, or approved with modifications, the Work Plan, the schedule, and any subsequent modifications shall be incorporated into and become fully enforceable under this Order.
- c. Respondents shall not commence any Work except in conformance with the terms of this Order. Respondents shall not commence implementation of the Work Plan developed hereunder until receiving written U.S. EPA approval pursuant to Paragraph 16(b).
- 17. Health and Safety Plan. Within 10 business days after the Effective Date, Respondents shall submit for U.S. EPA review and comment a plan that ensures the protection of the public health and safety during performance of on-Site work under this Order. This plan shall be prepared consistent with U.S. EPA's Standard Operating Safety Guide (PUB 9285.1-03, PB 92-963414, June 1992). In addition, the plan shall comply with all currently applicable Occupational Safety and Health Administration ("OSHA") regulations found at 29 C.F.R. Part 1910. If U.S. EPA determines that it is appropriate, the plan shall also include contingency planning. Respondents shall incorporate all changes to the plan recommended by U.S. EPA and shall implement the plan during the pendency of the removal action.

#### 18. Quality Assurance and Sampling.

a. All sampling and analyses performed pursuant to this Order shall conform to U.S. EPA direction, approval, and guidance regarding sampling, quality assurance/quality control ("QA/QC"), data validation, and chain of custody procedures. Respondents shall ensure that the laboratory used to perform the analyses participates in a QA/QC program that complies with the appropriate U.S. EPA guidance. Respondents shall follow, as appropriate, "Quality Assurance/Quality Control Guidance for Removal Activities: Sampling QA/QC Plan and Data Validation Procedures" (OSWER Directive No. 9360.4-01, April 1, 1990), as guidance for QA/QC and sampling. Respondents shall only use laboratories that have a documented Quality System that complies with ANSI/ASQC E-4 1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs"

(American National Standard, January 5, 1995), and "EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, March 2001)," or equivalent documentation as determined by U.S. EPA. U.S. EPA may consider laboratories accredited under the National Environmental Laboratory Accreditation Program ("NELAP") as meeting the Quality System requirements.

- b. Upon request by U.S. EPA, Respondents shall have such a laboratory analyze samples submitted by U.S. EPA for QA monitoring. Respondents shall provide to U.S. EPA the QA/QC procedures followed by all sampling teams and laboratories performing data collection and/or analysis.
- c. Upon request by U.S. EPA, Respondents shall allow U.S. EPA or its authorized representatives to take split and/or duplicate samples. Respondents shall notify U.S. EPA not less than 3 business days in advance of any sample collection activity, unless shorter notice is agreed to by U.S. EPA. U.S. EPA will attempt, but is not required, to notify Respondent's Project Coordinator 24-hours in advance of any sample collection activity by U.S. EPA. U.S. EPA shall have the right to take any additional samples that U.S. EPA deems necessary. Upon request, U.S. EPA shall allow Respondents to take split or duplicate samples of any samples it takes as part of its oversight of Respondents' implementation of the Work. U.S. EPA will share with Respondents the final analytical results obtained for samples collected by U.S. EPA in connection with this Order.
- 19. <u>Post-Removal Site Control</u>. In accordance with the Work Plan schedule, or as otherwise directed by U.S. EPA, Respondents shall submit a proposal for post-removal site control related to activities under this Order consistent with Section 300.415(*l*) of the NCP and OSWER Directive No. 9360.2-02. Upon U.S. EPA approval, Respondents shall implement such controls and shall provide U.S. EPA with documentation of all post-removal site control arrangements.

#### 20. Reporting.

- a. Respondents shall submit a written progress report to U.S. EPA concerning actions undertaken pursuant to this Order weekly until 60 days after approval of the Work Plan and every 30th day thereafter until termination of this Order, unless otherwise directed in writing by the OSC. These reports shall describe all significant developments during the preceding period, including the actions performed and any problems encountered, analytical data received during the reporting period, and the developments anticipated during the next reporting period, including a schedule of actions to be performed, anticipated problems, and planned resolutions of past or anticipated problems.
- b. Respondents shall submit to the OSC 3 copies of all plans, reports or other submissions required by this Order, or any approved work plan. Upon request by U.S. EPA, Respondents shall submit such documents in electronic form.

- c. Respondents who own or are in possession of real property at the Site shall, at least 30 days prior to the conveyance of any interest in such real property at the Site, give written notice to the transferee that the property is subject to this Order and written notice to U.S. EPA of the proposed conveyance, including the name and address of the transferee. Respondents who own or are in possession of real property at the Site also agree to require that their successors comply with the immediately preceding sentence and Sections IX (Site Access) and X (Access to Information).
- 21. Final Report. Within 90 calendar days after completion of all Work required by Section VIII of this Order, Respondents shall submit for U.S. EPA review a final report summarizing the actions taken to comply with this Order. The final report shall conform with the requirements set forth in Section 300.165 of the NCP entitled "OSC Reports" and with the guidance set forth in "Superfund Removal Procedures: Removal Response Reporting POLREPS and OSC Reports" (OSWER Directive No. 9360.3-03, June 1, 1994). The final report shall include a good faith estimate of total costs or a statement of actual costs incurred in complying with the Order, a listing of quantities and types of materials removed off-Site or handled on-Site, a discussion of removal and disposal options considered for those materials, a listing of the ultimate destination(s) of those materials, a presentation of the analytical results of all sampling and analyses performed, and accompanying appendices containing all relevant documentation generated during the removal action (e.g., manifests, invoices, bills, contracts, and permits). The final report shall also include the following certification signed by a person who supervised or directed the preparation of that report:

"Under penalty of law, I certify that to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of the report, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

#### 22. Off-Site Shipments.

- a. Respondents shall, prior to any off-Site shipment of Waste Material from the Site to an out-of-state waste management facility, provide written notification of such shipment of Waste Material to the appropriate state environmental official in the receiving facility's state and to the OSC. However, this notification requirement shall not apply to any off-Site shipments when the total volume of all such shipments will not exceed 10 cubic yards.
- i. Respondents shall include in the written notification the following information:

  1) the name and location of the facility to which the Waste Material is to be shipped; 2) the type and quantity of the Waste Material to be shipped; 3) the expected schedule for the shipment of the Waste Material; and 4) the method of transportation. Respondents shall notify the state in which the planned receiving facility is located of major changes in the shipment plan, such as a decision to ship the Waste Material to another facility within the same state, or to a facility in another state.

- ii. The identity of the receiving facility and state will be determined by Respondents following the award of the contract for the removal action. Respondents shall provide the information required by this Paragraph as soon as practicable after the award of the contract and before the Waste Material is actually shipped.
- b. Before shipping any hazardous substances, pollutants, or contaminants from the Site to an off-site location, Respondents shall obtain U.S. EPA's certification that the proposed receiving facility is operating in compliance with the requirements of CERCLA Section 121(d)(3), 42 U.S.C. § 9621(d)(3), and 40 C.F.R. § 300.440. Respondents shall only send hazardous substances, pollutants, or contaminants from the Site to an off-site facility that complies with the requirements of the statutory provision and regulation cited in the preceding sentence.

#### IX. SITE ACCESS

- 23. If the Site, or any other property where access is needed to implement this Order, is owned or controlled by any of the Respondents, such Respondents shall, commencing on the Effective Date, provide U.S. EPA, CMS or any other party performing the Work hereunder, their officers, employees and representatives, including contractors, with access at all reasonable times to the Site, or such other property, for the purpose of conducting any activity related to this Order. State and Tribal representatives will also be granted access to accompany EPA employees and contractors
- 24. Where any action under this Order is to be performed in areas owned by or in possession of someone other than Respondents, Respondents shall use their best efforts to obtain all necessary access agreements within 15 business days after the Effective Date, or as such longer period as specified in writing by the OSC. Any access agreement must give U.S. EPA, the State and the Tribe access in the manner described in Paragraph 23. Respondents shall immediately notify U.S. EPA if after using their best efforts they are unable to obtain such agreements. For purposes of this Paragraph, "best efforts" includes the payment of reasonable sums of money in consideration of access. Respondents shall describe in writing their efforts to obtain access. U.S. EPA may then, as expeditiously as practicable, assist Respondents in gaining access, to the extent necessary to effectuate the response actions described herein, using such means as U.S. EPA deems appropriate. Such means may include utilization of U.S. EPA's access authorities under Section 104(e) of CERCLA, 42 U.S.C. § 9604(e) and 40 C.F.R. § 300.400(d). Respondents shall reimburse U.S. EPA for all costs and attorney's fees incurred by the United States in obtaining such access, in accordance with the procedures in Section XV (Payment of Response Costs). If Respondents fail to obtain access to an area or areas owned by or controlled by someone other than Respondents after complying with the terms of this provision, Respondents shall not be liable for stipulated penalties under this Order or otherwise be liable for failure to comply with this Order or failure to meet any schedules or milestones in the Order, the Work Plan or other plans approved under this Order with respect to properties to which access has been denied for the period of time that access was not secured.

25. Notwithstanding any provision of this Order, U.S. EPA and the State retain all of their access authorities and rights, including enforcement authorities related thereto, under CERCLA, RCRA, the July 11, 1994 Administrative Agreement and Covenant Not To Sue pertaining to the Site and any other applicable statutes or regulations. The Tribe similarly retains whatever rights of access it may have under applicable law.

#### X. ACCESS TO INFORMATION

- 26. Subject to Paragraphs 27 and 28, Respondents shall provide to U.S. EPA, upon request, copies of all non-privileged documents and information within their possession or control or that of their contractors or agents relating to activities at the Site or to the implementation of this Order, including, but not limited to, sampling, analysis, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence, or other documents or information related to the Work. Each Respondent shall also use its best efforts to make available to U.S. EPA, for purposes of investigation, information gathering, or testimony, its employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work at reasonable times and upon reasonable notice subject to Paragraphs 27 and 28.
- 27. Except as provided in Paragraph 29, Respondents may assert business confidentiality claims covering part or all of the documents or information submitted to U.S. EPA under this Order to the extent permitted by and in accordance with Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and 40 C.F.R. § 2.203(b). Documents or information determined to be confidential by U.S. EPA will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality accompanies documents or information when they are submitted to U.S. EPA, or if U.S. EPA has notified Respondents that the documents or information are not confidential under the standards of Section 104(e)(7) of CERCLA or 40 C.F.R. Part 2, Subpart B, the public may be given access to such documents or information without further notice to Respondents.
- 28. Except as provided in Paragraph 29, Respondents may assert that certain documents, records and other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If the Respondents assert such a privilege in lieu of providing documents, they shall provide U.S. EPA with the following: 1) the title of the document, record, or information; 2) the date of the document, record, or information; 3) the name and title of the author of the document, record, or information; 4) the name and title of each addressee and recipient; 5) a description of the subject of the document, record, or information; and 6) the privilege asserted by Respondents. However, no documents, reports or other information created or generated pursuant to the requirements of this Order shall be withheld on the grounds that they are privileged.
- 29. No claim of confidentiality shall be made with respect to any data regarding conditions at or around the Site, including, but not limited to, all sampling, analytical, monitoring, hydrogeologic, scientific, chemical, or engineering data, or any other documents or information evidencing conditions at or around the Site.

#### XI. RECORD RETENTION

- 30. Until 6 years after Respondents' receipt of U.S. EPA's approval of Respondents' final report pursuant to Paragraph 72, Respondents shall preserve and retain all non-identical copies of records and documents (including records or documents in electronic form) now in its possession or control or which come into its possession or control that relate in any manner to the performance of the Work or the liability of any person under CERCLA with respect to the Site, regardless of any corporate retention policy to the contrary. Each Respondent shall also instruct their respective contractors and agents to preserve all documents, records, and information of whatever kind, nature or description relating to performance of the Work.
- 31. At the conclusion of this document retention period, Respondents shall notify U.S. EPA at least 60 days prior to the destruction of any such records or documents, and, upon request by U.S. EPA, Respondents shall deliver any such non-privileged records or documents to U.S. EPA. Respondents may assert that certain documents, records and other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If Respondents assert such a privilege, they shall provide U.S. EPA with the following: 1) the title of the document, record, or information; 2) the date of the document, record, or information; 3) the name and title of the author of the document, record, or information; 4) the name and title of each addressee and recipient; 5) a description of the subject of the document, record, or information; and 6) the privilege asserted by Respondents. However, no documents, reports or other information created or generated pursuant to the requirements of this Order shall be withheld from U.S. EPA on the grounds that they are privileged.
- 32. Each Respondent hereby certifies individually that to the best of its knowledge and belief, after thorough inquiry, it has not altered, mutilated, discarded, destroyed or otherwise disposed of any records, documents or other information (other than identical copies) relating to its potential liability regarding the Site since notification of potential liability by U.S. EPA and that it has fully complied and will fully comply with any and all U.S. EPA requests for information pursuant to Sections 104(e) and 122(e) of CERCLA, 42 U.S.C. §§ 9604(e) and 9622(e), and Section 3007 of RCRA, 42 U.S.C. § 6927.

#### XII. COMPLIANCE WITH OTHER LAWS

33. Respondents shall perform all actions required pursuant to this Order in accordance with all applicable local, state, and federal laws and regulations except as provided in Section 121(e) of CERCLA, 42 U.S.C. § 6921(e), and 40 C.F.R. §§ 300.400(e) and 300.415(j). In accordance with 40 C.F.R. § 300.415(j), all on-Site actions required pursuant to this Order shall, to the extent practicable, as determined by U.S. EPA, considering the exigencies of the situation, attain applicable or relevant and appropriate requirements ("ARARs") under federal environmental or state environmental or facility siting laws. Respondents shall identify ARARs under federal law in the Work Plan subject to U.S. EPA approval. EPA will consult with the State with respect to ARARS under state environmental or facility siting laws.

#### XIII. EMERGENCY RESPONSE AND NOTIFICATION OF RELEASES

- 34. In the event of any action or occurrence during performance of the Work which causes or threatens a release of Waste Material from the Site that constitutes an emergency situation or may present an immediate threat to public health or welfare or the environment, Respondents shall immediately take all appropriate action. Respondents shall take these actions in accordance with all applicable provisions of this Order, including, but not limited to, the Health and Safety Plan, in order to prevent, abate or minimize such release or endangerment caused or threatened by the release. Respondents shall also immediately notify the OSC or, in the event of his/her unavailability, the Regional Duty Officer, Emergency Response Branch, Region 5 at (312) 353-2318, of the incident or Site conditions. In the event that Respondents fail to take appropriate response action as required by this Paragraph, and U.S. EPA takes such action instead, Respondents shall reimburse U.S. EPA all costs of the response action not inconsistent with the NCP pursuant to Section XV (Payment of Response Costs).
- 35. In addition, in the event of any release of a reportable quantity of a hazardous substance from the Site, Respondents shall immediately notify the OSC at (312) 353-2318 and the National Response Center at (800) 424-8802. Respondents shall submit a written report to U.S. EPA within 7 business days after each release, setting forth the events that occurred and the measures taken or to be taken to mitigate any release or endangerment caused or threatened by the release and to prevent the reoccurrence of such a release. This reporting requirement is in addition to, and not in lieu of, reporting under Section 103(c) of CERCLA, 42 U.S.C. § 9603(c), and Section 304 of the Emergency Planning and Community Right-To-Know Act of 1986, 42 U.S.C. § 11004, et seq.

#### XIV. AUTHORITY OF ON-SCENE COORDINATOR

36. The OSC shall be responsible for overseeing Respondents' implementation of this Order. The OSC shall have the authority vested in an OSC by the NCP, including the authority to halt, conduct, or direct any Work required by this Order, or to direct any other removal action undertaken at the Site. Absence of the OSC from the Site shall not be cause for stoppage of work unless specifically directed by the OSC.

#### XV. PAYMENT OF RESPONSE COSTS

#### 37. Payments for Future Response Costs.

a. Respondents shall pay U.S. EPA Future Response Costs up to \$500,000 not inconsistent with the NCP. On a periodic basis, U.S. EPA will send Respondents a bill requiring payment that consists of an Itemized Cost Summary. Respondents shall make all payments within 30 calendar days of receipt of each bill requiring payment, except as otherwise provided in Paragraph 39 of this Order.

b. Respondents shall make all payments required by this Paragraph by a certified or cashier's check or checks made payable to "U.S. EPA Hazardous Substance Superfund," referencing the name and address of the party(ies) making payment and U.S. EPA Site/Spill ID number B5AM. Respondents shall send the check(s) to:

U.S. Environmental Protection Agency Program Accounting & Analysis Section P.O. Box 70753 Chicago, Illinois 60673

- c. At the time of payment, Respondents shall send notice that payment has been made to the Director, Superfund Division, U.S. EPA Region 5, 77 West Jackson Blvd., Chicago, Illinois, 60604-3590 and to Rodger Field, Associate Regional Counsel, 77 West Jackson Boulevard, C-14J, Chicago, Illinois, 60604-3590.
- 38. In the event that payments for Future Response Costs are not made within 30 days of Respondents' receipt of a bill, Respondents shall pay Interest on the unpaid balance. The Interest on Future Response Costs shall begin to accrue on the date of the bill and shall continue to accrue until the date of payment. Payments of Interest made under this Paragraph shall be in addition to such other remedies or sanctions available to the United States by virtue of Respondents' failure to make timely payments under this Section, including but not limited to, payment of stipulated penalties pursuant to Section XVIII.
- 39. Respondents may dispute all or part of a bill for Future Response Costs submitted under this Order, only if Respondents allege that U.S. EPA has made an accounting error, or if Respondents allege that a cost item is inconsistent with the NCP. If any dispute over costs is resolved before payment is due, the amount due will be adjusted as necessary. If the dispute is not resolved before payment is due, Respondents shall pay the full amount of the uncontested costs to U.S. EPA as specified in Paragraph 37 on or before the due date. Within the same time period, Respondents shall pay the full amount of the contested costs into an interest-bearing escrow account. Respondents shall simultaneously transmit a copy of both checks to the persons listed in Paragraph 37(c) above. Respondents shall ensure that the prevailing party or parties in the dispute shall receive the amount upon which they prevailed from the escrow funds plus Interest within 20 calendar days after the dispute is resolved.

#### XVI. <u>DISPUTE RESOLUTION</u>

40. Unless otherwise expressly provided for in this Order, the dispute resolution procedures of this Section shall be the exclusive mechanism for resolving disputes arising under this Order. The Parties shall attempt to resolve any disagreements concerning this Order expeditiously and informally.

- 41. If Respondents object to any U.S. EPA action taken pursuant to this Order, including billings for Future Response Costs, they shall notify U.S. EPA in writing of their objection(s) within 10 business days of such action, unless the objection(s) has/have been resolved informally. This written notice shall include a statement of the issues in dispute, the relevant facts upon which the dispute is based, all factual data, analysis or opinion supporting Respondents' position, and all supporting documentation on which such party relies. U.S. EPA shall provide its Statement of Position, including supporting documentation, no later than 10 business days after receipt of the written notice of dispute. In the event that these 10-day time periods for exchange of written documents may cause an unacceptable delay in the work, they shall be shortened upon, and in accordance with, notice by U.S. EPA. The time periods for exchange of written documents relating to disputes over billings for response costs may be extended at the sole discretion of U.S. EPA. An administrative record of any dispute under this Section shall be maintained by U.S. EPA. The record shall include Respondents' written notification of such dispute, and U.S. EPA's Statement of Position served pursuant to this paragraph. Upon review of the administrative record, the Director of the Superfund Division, U.S. EPA Region 5, shall resolve the dispute consistent with the NCP and the terms of this Order.
- 42. Any agreement reached by the Parties resolving a written notice of dispute shall be reduced to writing and shall, upon signature by both Parties, be incorporated into and become an enforceable part of this Order. Respondents' obligations under this Order shall not be tolled by submission of any objection for dispute resolution under this Section. Following resolution of the dispute, as provided by this Section, Respondents shall fulfill the requirement that was the subject of the dispute in accordance with the agreement reached or with U.S. EPA's decision, whichever occurs.

#### XVII. FORCE MAJEURE

- 43. Respondents agree to perform all requirements of this Order within the time limits established under this Order, unless the performance is delayed by a *force majeure*. For purposes of this Order, a *force majeure* is defined as any event arising from causes beyond the control of Respondents, or of any entity controlled by Respondents, including but not limited to their contractors and subcontractors, which delays or prevents performance of any obligation under this Order despite Respondents' best efforts to fulfill the obligation. *Force majeure* does not include financial inability to complete the Work or increased cost of performance. This Section is subject to Paragraph 24.
- 44. If any event occurs or has occurred that may delay the performance of any obligation under this Order, whether or not caused by a *force majeure* event, Respondents shall notify U.S. EPA orally within 24 hours of when Respondents first knew that the event might cause a delay. Within 7 calendar days thereafter, Respondents shall provide to U.S. EPA in writing an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; Respondents' rationale for attributing such delay to a *force majeure* event if they intend to assert such a claim;

and a statement as to whether, in the opinion of Respondents, such event may cause or contribute to an endangerment to public health, welfare or the environment. Failure to comply with the above requirements shall be grounds for U.S. EPA to deny Respondents an extension of time for performance for any period prior to the time when notice is actually provided. Respondents shall have the burden of demonstrating by a preponderance of the evidence that the event is a <u>force majeure</u>, that the delay is warranted under the circumstances, and that best efforts were exercised to avoid and mitigate the effects of the delay.

45. If U.S. EPA agrees that the delay or anticipated delay is attributable to a force majeure event, the time for performance of the obligations under this Order that are affected by the force majeure event will be extended by U.S. EPA for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the force majeure event shall not, of itself, extend the time for performance of any other obligation. If U.S. EPA does not agree that the delay or anticipated delay has been or will be caused by a force majeure event, U.S. EPA will notify Respondents in writing of its decision. If U.S. EPA agrees that the delay is attributable to a force majeure event, U.S. EPA will notify Respondents in writing of the length of the extension, if any, for performance of the obligations affected by the force majeure event.

#### XVIII. STIPULATED PENALTIES

- 46. Respondents shall be liable to U.S. EPA for stipulated penalties in the amounts set forth in Paragraphs 47 and 48 for failure to comply with the requirements of this Order specified below, unless excused under Section XVII (Force Majeure). "Compliance" by Respondents shall include completion of the activities under this Order or any work plan or other plan approved under this Order identified below in accordance with all applicable requirements of this Order within the specified time schedules established by and approved under this Order.
- 47. <u>Stipulated Penalty Amounts Work</u>. Except as provided in Paragraph 48, Respondents shall pay \$ 500 per day for each day not in compliance with the terms of this Order for the first ten (10 days) and \$ 1000 per day for each day thereafter through the 30<sup>th</sup> day of non-compliance. For each day not in compliance with the Work to be performed under this Order after the 30<sup>th</sup> day, Respondents shall pay 4,000 per day of non-compliance.
- 48. <u>Stipulated Penalty Amounts Reports</u>. Respondents shall pay \$ 100 per day for each day not in compliance with the requirement to submit reports or other documentation under this Order for the first ten (10 days) and \$1,000 per day for each day thereafter through the 30<sup>th</sup> day of non-compliance. For each day not in compliance with the the requirement to submit reports or other documentation after the 30<sup>th</sup> day, Respondents shall pay \$2,000 per day of non-compliance.
- 49. All penalties shall begin to accrue on the day after the complete performance is due or the day a violation occurs, and shall continue to accrue through the final day of the correction of the noncompliance or completion of the activity. However, stipulated penalties shall not accrue: 1) with respect to a deficient submission under Section VIII (Work to be Performed), during the

period, if any, beginning on the 31st day after U.S. EPA's receipt of such submission until the date that U.S. EPA notifies Respondents of any deficiency; and 2) with respect to a decision by the Director of the Superfund Division, Region 5, under Paragraph 41 of Section XVI (Dispute Resolution), during the period, if any, beginning on the 21st day after U.S. EPA submits its written statement of position until the date that the Director of the Superfund Division issues a final decision regarding such dispute. Stipulated penalties shall not be payable in respect of a delay occasioned by a dispute that is resolved in Respondents' favor under Section XVI. Nothing herein shall prevent the simultaneous accrual of separate penalties for separate violations of this Order.

- 51. Following U.S. EPA's determination that Respondents have failed to comply with a requirement of this Order, U.S. EPA may give Respondents written notification of the failure and describe the noncompliance. U.S. EPA may send Respondents a written demand for payment of the penalties. However, penalties shall accrue as provided in the preceding Paragraph regardless of whether U.S. EPA has notified Respondents of a violation.
- 52. All penalties accruing under this Section shall be due and payable to U.S. EPA within 30 days of Respondents' receipt from U.S. EPA of a demand for payment of the penalties, unless Respondents invoke the dispute resolution procedures under Section XVI (Dispute Resolution). All payments to U.S. EPA under this Section shall be paid by certified or cashier's check(s) made payable to "U.S. EPA Hazardous Substances Superfund," shall be mailed to U.S. Environmental Protection Agency, Program Accounting & Analysis Section, P.O. Box 70753, Chicago, Illinois 60673, shall indicate that the payment is for stipulated penalties, and shall reference the U.S. EPA Site/Spill ID Number B5AM, the U.S. EPA Docket Number, and the name and address of the party(ies) making payment. Copies of check(s) paid pursuant to this Section, and any accompanying transmittal letter(s), shall be sent to U.S. EPA as provided in Paragraph 37(c).
- 53. The payment of stipulated penalties shall not alter in any way Respondents' obligation to complete performance of the Work required under this Order.
- 54. Penalties shall continue to accrue during any dispute resolution period, but need not be paid until 30 days after the dispute is resolved by agreement or by receipt of U.S. EPA's decision and receipt of a demand for payment in accordance with Paragraph 52.
- 55. If Respondents fail to pay stipulated penalties when due, U.S. EPA may institute proceedings to collect the penalties, as well as Interest. Respondents shall pay Interest on the unpaid balance, which shall begin to accrue on the date of demand made pursuant to Paragraph 52. Nothing in this Order shall be construed as prohibiting, altering, or in any way limiting the ability of U.S. EPA to seek any other remedies or sanctions available by virtue of Respondents' violation of this Order or of the statutes and regulations upon which it is based, including, but not limited to, penalties pursuant to Sections 106(b) and 122(l) of CERCLA, 42 U.S.C. §§ 9606(b) and 9622(l), and punitive damages pursuant to Section 107(c)(3) of CERCLA, 42 U.S.C. § 9607(c)(3), provided, however, that U.S. EPA shall not seek civil penalties pursuant to Section 106(b) or 122(l) of CERCLA or punitive damages pursuant to Section 107(c)(3) of CERCLA for any

violation for which a stipulated penalty has been assessed and collected herein, except in the case of a willful violation of this Order. Should Respondents violate this Order or any portion hereof, U.S. EPA may carry out the required actions unilaterally, pursuant to Section 104 of CERCLA, 42 U.S.C. §9604, and/or may seek judicial enforcement of this Order pursuant to Section 106 of CERCLA, 42 U.S.C. §9606. Notwithstanding any other provision of this Section, U.S. EPA may, in its unreviewable discretion, waive in writing any portion of stipulated penalties that have accrued pursuant to this Order.

#### XIX. COVENANT NOT TO SUE BY U.S. EPA

56. In consideration of the actions that will be performed and the payments that will be made by Respondents under the terms of this Order, and except as otherwise specifically provided in this Order, U.S. EPA covenants not to sue or to take administrative action against Respondents pursuant to Sections 106 and 107(a) of CERCLA, 42 U.S.C. §§ 9606 and 9607(a), for performance of the Work and for recovery of Future Response Costs paid hereunder. This covenant not to sue shall take effect upon the Effective Date and is conditioned upon the complete and satisfactory performance by Respondents of all obligations under this Order, including, but not limited to, payment of Future Response Costs pursuant to Section XV. This covenant not to sue extends only to Respondents and does not extend to any other person.

#### XX. RESERVATIONS OF RIGHTS BY U.S. EPA

- 57. Except as specifically provided in this Order, nothing herein shall limit the power and authority of U.S. EPA or the United States to take, direct, or order all actions necessary to protect public health, welfare, or the environment or to prevent, abate, or minimize an actual or threatened release of hazardous substances, pollutants or contaminants, or hazardous or solid waste on, at, or from the Site. Further, nothing herein shall prevent U.S. EPA from seeking legal or equitable relief to enforce the terms of this Order. U.S. EPA also reserves the right to take any other legal or equitable action as it deems appropriate and necessary, or to require the Respondents in the future to perform additional activities pursuant to CERCLA or any other applicable law.
- 58. The covenant not to sue set forth in Section XIX above does not pertain to any matters other than those expressly identified therein. U.S. EPA reserves, and this Order is without prejudice to, all rights against Respondents with respect to all other matters, including, but not limited to:
  - a. claims based on a failure by any Respondent to meet a requirement of this Order applicable to it;
  - b. liability for any Future Response Costs not paid under this Order and liability for costs not included within the definition of Future Response Costs;

- c. liability for performance of response action other than the Work;
- d. criminal liability;
- e. liability for damages for injury to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments;
- f. liability arising from the past, present, or future disposal, release or threat of release of Waste Materials outside of the Site; and
- g. liability for costs incurred or to be incurred by the Agency for Toxic Substances and Disease Registry related to the Site.

#### XXI. COVENANT NOT TO SUE BY RESPONDENTS

- 59. Respondents covenant not to sue and agree not to assert any claims or causes of action against the United States, or its contractors or employees, with respect to the Work, Future Response Costs, or this Order, including, but not limited to:
- a. any direct or indirect claim for reimbursement from the Hazardous Substance Superfund established by 26 U.S.C. § 9507, based on Sections 106(b)(2), 107, 111, 112, or 113 of CERCLA, 42 U.S.C. §§ 9606(b)(2), 9607, 9611, 9612, or 9613, or any other provision of law;
- b. any claim arising out of response actions at or in connection with the Site, including any claim under the United States Constitution, the Michigan Constitution, the Tucker Act, 28 U.S.C. § 1491, the Equal Access to Justice Act, 28 U.S.C. § 2412, as amended, or at common law; or
- c. any claim against the United States pursuant to Sections 107 and 113 of CERCLA, 42 U.S.C. §§ 9607 and 9613, relating to the Site.

These covenants not to sue shall not apply in the event the United States brings a cause of action or issues an order pursuant to the reservations set forth in Paragraphs 58 (b), (c), and (e) - (g), but only to the extent that Respondents' claims arise from the same response action, response costs, or damages that the United States is seeking pursuant to the applicable reservation, or Paragraph 78.

60. Nothing in this Agreement shall be deemed to constitute approval or preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S.C. § 9611, or 40 C.F.R. § 300.700(d).

#### XXII. OTHER CLAIMS

- 61. By issuance of this Order, the United States and U.S. EPA assume no liability for injuries or damages to persons or property resulting from any acts or omissions of Respondents. The United States or U.S. EPA shall not be deemed a party to any contract entered into by Respondents or their directors, officers, employees, agents, successors, representatives, assigns, contractors, or consultants in carrying out actions pursuant to this Order.
- 62. Except as expressly provided in Section XIX (Covenant Not to Sue by U.S. EPA), nothing in this Order constitutes a satisfaction of or release from any claim or cause of action against Respondents or any person not a party to this Order, for any liability such person may have under CERCLA, other statutes, or common law, including but not limited to any claims of the United States for costs, damages and interest under Sections 106 and 107 of CERCLA, 42 U.S.C. §§ 9606 and 9607.
- 63. No action or decision by U.S. EPA pursuant to this Order shall give rise to any right to judicial review, except as set forth in Section 113(h) of CERCLA, 42 U.S.C. § 9613(h).

#### XXIII. CONTRIBUTION PROTECTION

64. The Parties agree that Respondents are entitled, as of the Effective Date, to protection from contribution actions or claims as provided by Sections 113(f)(2) and 122(h)(4) of CERCLA, 42 U.S.C. §§ 9613(f)(2) and 9622(h)(4), for "matters addressed" in this Order. The "matters addressed" in this Order are the Work and Future Response Costs. "Matters addressed" excludes, for purposes of Contribution Protection provided for herein, any agreements between or among any two or more of the following: Bay Harbor Golf Club, Inc., Boyne USA Inc., Bay Harbor Company, L.L.C. and/or CMS Energy Corporation and their predecessors and affiliates, the effective date of which agreements predate the date of this AOC, thus preserving all rights and obligations of the parties under said agreements. Nothing in this Order precludes the United States or Respondents from asserting any claims, causes of action, or demands against any persons not parties to this Order for indemnification, contribution, or cost recovery.

#### XXIV. <u>INDEMNIFICATION</u>

65. Respondents shall indemnify, save and hold harmless the United States, its officials, agents, contractors, subcontractors, employees and representatives from any and all claims or causes of action arising from, or on account of, negligent or other wrongful acts or omissions of Respondents, their officers, directors, employees, agents, contractors, or subcontractors, in carrying out actions pursuant to this Order. In addition, Respondents agree to pay the United States all costs incurred by the United States, including but not limited to attorneys fees and other expenses of litigation and settlement, arising from or on account of claims made against the United States based on negligent or other wrongful acts or omissions of Respondents, their officers, directors, employees, agents, contractors, subcontractors and any persons acting on their behalf or under their control, in carrying out activities pursuant to this Order. The United States

shall not be held out as a party to any contract entered into by or on behalf of Respondents in carrying out activities pursuant to this Order. Neither Respondents nor any such contractor shall be considered an agent of the United States. The Federal Tort Claims Act (28 U.S.C. §§ 2671, 2680) provides coverage for injury or loss of property, or injury or death caused by the negligent or wrongful act or omission of an employee of U.S. EPA while acting within the scope of his or her employment, under circumstances where U.S. EPA, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred.

- 66. The United States shall give Respondents notice of any claim for which the United States plans to seek indemnification pursuant to this Section and shall consult with Respondents prior to settling such claim.
- 67. Respondents waive all claims against the United States for damages or reimbursement or for set-off of any payments made or to be made to the United States, arising from or on account of any contract, agreement, or arrangement between any one or more of Respondents and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays. In addition, Respondents shall indemnify and hold harmless the United States with respect to any and all claims for damages or reimbursement arising from or on account of any contract, agreement, or arrangement between any one or more of Respondents and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays.

#### XXV. MODIFICATIONS

- 68. For good cause, the OSC may make modifications to any plan or schedule in writing or by oral direction. Any oral modification will be memorialized in writing by U.S. EPA promptly, but shall have as its effective date the date of the OSC's oral direction. Any provision or other requirements of this Order may be modified in writing by mutual agreement of the parties.
- 69. If Respondents seek permission to deviate from any approved work plan or schedule, Respondents' Project Coordinator shall submit a written request to U.S. EPA for approval outlining the proposed modification and its basis. Respondents may not proceed with the requested deviation until receiving oral or written approval from the OSC pursuant to Paragraph 68.
- 70. No informal advice, guidance, suggestion, or comment by the OSC or other U.S. EPA representatives regarding reports, plans, specifications, schedules, or any other writing submitted by Respondents shall relieve Respondents of their obligation to obtain any formal approval required by this Order, or to comply with all requirements of this Order, unless it is formally modified.

#### XXVI. ADDITIONAL WORK

71. If U.S. EPA or Respondents determine that work consistent with this Order that is not included in the Work Plan and is necessary to protect human health or the environment, that party shall notify in writing the other party of the additional work necessary and the reasons for the additional work. Respondents must complete any additional work requested or approved by U.S. EPA according to U.S. EPA's specifications. Respondents must propose and submit a schedule for additional work for U.S. EPA's approval. The Parties shall confer in good faith to achieve agreement on the need for additional work. Should Respondents object to a U.S. EPA determination that additional work is necessary or U.S. EPA's failure to approve a request by Respondents for additional work, Respondents may object to such determination pursuant to Section XVI. U.S. EPA may modify or determine the schedule for additional work. This Section does not alter or diminish the OSC's authority under Paragraph 68 of this Order.

### XXVII. NOTICE OF COMPLETION OF WORK

72. When U.S. EPA determines, after U.S. EPA's review of the Final Report, that all Work has been fully performed in accordance with this Order, with the exception of any continuing obligations required by this Order, including, e.g., post-removal site controls, payment of Future Response Costs, and record retention, U.S. EPA will provide written notice to Respondents. If U.S. EPA determines that any such Work has not been completed in accordance with this Order, U.S. EPA will notify Respondents, provide a list of the deficiencies, and require that Respondents modify the Work Plan if appropriate in order to correct such deficiencies. Respondents shall implement the modified and approved Work Plan and shall submit a modified Final Report in accordance with the U.S. EPA notice. Failure by Respondents to implement the approved modified Work Plan shall be a violation of this Order.

#### XXVIII. SEVERABILITY/INTEGRATION/ATTACHMENTS

- 73. If a court issues an order that invalidates any provision of this Order or finds that Respondents have sufficient cause not to comply with one or more provisions of this Order, each Respondent shall remain bound to comply with all provisions of this Order applicable to it not invalidated or determined to be subject to a sufficient cause defense by the court's order.
- 74. This Order and its attachments constitute the final, complete and exclusive agreement and understanding among the Parties with respect to the settlement embodied in this Order. The parties acknowledge that there are no representations, agreements or understandings relating to the settlement other than those expressly contained in this Order.

### XXVIII-A. OBLIGATIONS OF RESPONDENT BAY HARBOR COMPANY

75. It is agreed that only the following provisions of this Order apply to, and are binding on, Respondent Bay Harbor Company: 2, 3, 4, 5, 6(last sentence), 8, 23, 25, 26, 27, 28, 29, 30, 31, 32, 57, 58, 59, 60, 61, 62, 63, 73, 74 and 80. Respondent Bay Harbor Company will cooperate with CMS in providing information that may be reasonably necessary to obtain access for areas owned or in possession of persons other than Respondent Bay Harbor Company. Persons with

access under Paragraph 23 will provide identification upon request to Respondent Bay Harbor Company's authorized security personnel upon entry to property owned or controlled by Respondent Bay Harbor Company.

- 76. It is agreed that Respondent Bay Harbor Company will also have the benefits of Paragraphs 4, 40-42 (provided that these paragraphs do not apply to any dispute arising over access under Paragraph 23), 43-45, 56 and 64.
- 77. Respondent Bay Harbor Company shall be liable to U.S. EPA for stipulated penalties in the amount of \$4,000 per day for each day access is not granted pursuant to Paragraph 23 above commencing on the fourth day after access is denied. Stipulated penalties will not accrue unless telephonic notice is given of the denial of access, which notice will be complete upon calling Dennis Brya (231-439-2541 or 231-838-2541(cell)) or, in his absence, Robert Carson (248-644-4840 ext. 227). Paragraphs 49-52 and 54-55 shall be applicable to any stipulated penalties accruing under this paragraph. The payment of stipulated penalties shall not alter in any way Respondent Bay Harbor Company's obligation to comply with the provisions of this Order as set forth in Paragraph 75 above.
- 78. Notwithstanding any provision of this Order, and without limitation on the reservations set forth in Paragraphs 57 and 58, U.S. EPA reserves all rights against Respondent Bay Harbor Company, including, but not limited to, the right to take further enforcement action to perform the Work, in the event of non-compliance by any party with the terms of this Order.
- 79. In the event U.S. EPA takes action against Respondent Bay Harbor Company under any reservation of rights herein, Respondent Bay Harbor Company reserves the right to contest and defend against any such action.

### XXIX. EFFECTIVE DATE

80. This Order shall be effective upon signature by the Director, Superfund Division, U.S. EPA Region 5. Upon such signature, U.S. EPA shall immediately deliver a copy of the executed Order to Respondents.

The undersigned representatives of Respondents each certify that they are fully authorized to enter into the terms and conditions of this Order and to bind the party they represent to this document.

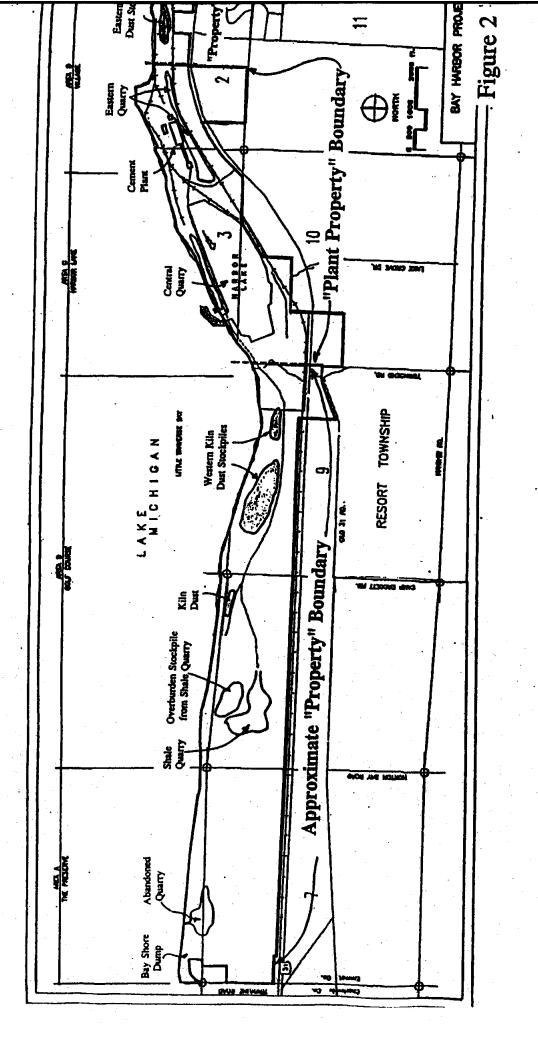
For Respondent Bay Harbor Company
By Sam V Show
Title Chairman
Date: 2-05-05
It is so ORDERED and Agreed this 22 day of February, 2005
BY: Richard C Kal
Richard Karl, Director
Superfund Division
United States Environmental Protection Agency
Region 5

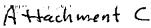
### ATTACHMENT A

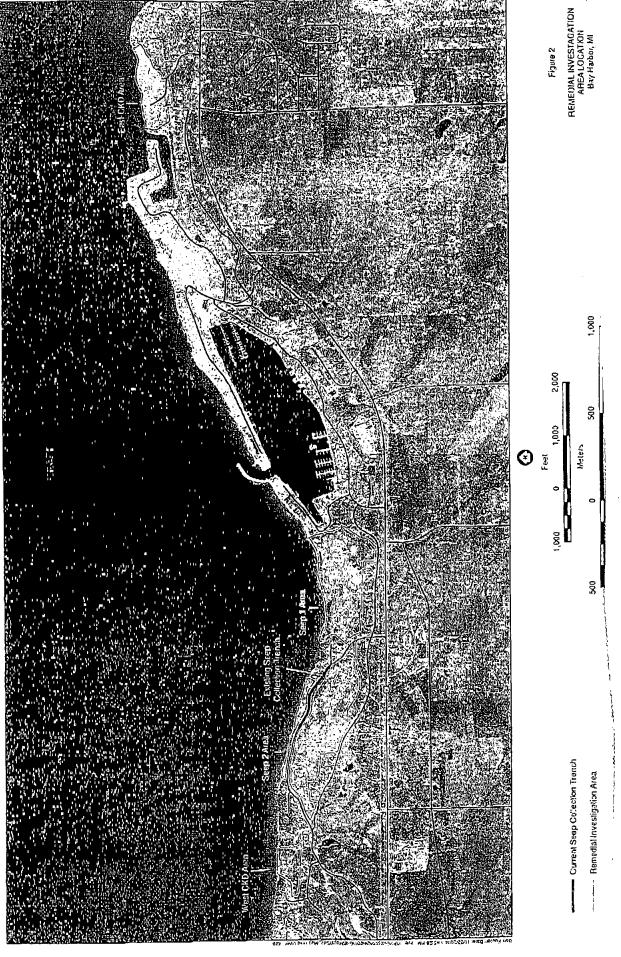
### RESPONDENTS

- (1) CMS LAND COMPANY
- (2) CMS CAPITAL, CORP. afgadnan 2/08/2005
- (3) BAY HARBOR COMPANY

### ATTACHMENT B







CAC & noiges A932U-mona msTS:

areas are approximately shown as Seep 1 Area and Seep

CKD Release Area

# Attachment No. 3

**Property Owners** 

# Supplemental Information for Joint Permit Application 5548 Charlevoix Road, Petoskey, Michigan

### Item 3. Applicant, Agent/Contractor, and Property Owner Information

### <u>List of Property Owners</u>

Bay Harbor Golf Club, Inc. c/o Boyne USA, Inc. Boyne Mountain Road Boyne Falls, MI 49712

Bay Harbor Company, LLC 27400 Northwestern Highway Southfield, MI 48034

City of Petoskey 100 West Lake Street Petoskey, MI 49770

Note: access to properties via Administrative Order of Consent for Removal Action, Little Traverse Bay CKD Release Site (Docket No. VW-05-C-810, February 22, 2005.

# Attachment No. 4

Drilling Mud Detection and Response Plan



Barr Engineering Company

4700 West 77th Street • Minneapolis, MN 55435-4803

Phone: 952-832-2600 • Fax: 952-832-2601 • www.barr.com An EEO Employer

Minneapolis, MN • Hibbing, MN • Duluth, MN • Ann Arbor, MI • Jefferson City, MO

### **Technical Memorandum**

To: Ellen Richard From: Alina Heydt

**Subject:** Drilling Mud Detection and Response Plan – Horizontal Directional Drill

**Date:** April 24, 2008

Project: 22/24-001
c: Project File

Horizontal Directional Drilling (HDD) is a construction technique that typically installs buried utilities with minimum environmental impact. The design of the HDD crossings uses practices to minimize the possibility of significant drilling fluid releases to the surface. There is however a risk that drilling mud could be inadvertently released to the surface during construction. This document describes the plan, prevention and control measure to minimize impacts of an inadvertent release of drilling mud to the ground surface during directional drilling of a wetland. The contractor (Northern A1) and their subcontractors will be responsible for implementation of this Plan.

The industry standard for HDD drilling fluid is bentonite clay and freshwater slurry. Bentonite as defined by the US EPA is not a hazardous material. Typical drilling fluids are composed of approximately four percent by volume of bentonite and 96 percent by volume of water.

On-Site observation of the crossing area will be conducted during all active drilling with mud circulation.

All personnel on-Site will be trained to detect and response to an inadvertent release of drilling mud.

Inadvertent releases to upland areas can be contained to prevent further movement of mud. In this event containment equipment will be used and may include equipment such as hay bales, silt fences, and plastic sheeting.

Inadvertent releases to a wetland area require that drilling operations be suspended immediately. The discharge will then be evaluated and appropriate response and containment measures will be utilized. In the event that hand placed barriers cannot be used, the excess mud will be held within a containment area.

#### **Technical Memorandum**

To: EKK

From: AMH2
Subject: Drilling Mud Detection and Response Plan – Horizontal Directional Drill

Date: 4/23/08 Page:

It will then be removed using pumps or other appropriate measures. The mud will be disposed of at an approved disposal facility.

The appropriate personnel at the Michigan Department of Environmental Quality will be notified in the event that there is a release to a wetland. A clean-up plan will be developed following the release to address restoration of the impacted areas.